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VOL. LXXXVI. JUNE 25, 1920. No. 2,222.

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FRENCH ELECTRICAL INDUSTRY—AMERICAN RELATIONS.

THE report of the directors of the Compagnie Française pour l'Exploitation des Procédés Thomson-Houston states that 1919 was a year of transition, and the reorganisation of the whole of the works which was proceeded with after the fusion with the Eclairage Electrique, had not taken place without some inconvenience in the activity of certain departments. During the year the company continued to clear up pre-war orders which had not been settled, and with the spirit of conciliation shown by all parties, it had been possible to bring them to a satisfactory issue in nearly all cases, without legal proceedings, and without excessive sacrifices. After referring to the capital augmentation from 120 to 200 millions of francs, the report approaches the question of exchange, particularly with the United States, in consequence of the company's purchases from the General Electric Co. It mentions that the rise in exchange might be followed by a very onerous burden on the French company for the purchases made for its own account, and much more still for its customers. Desirous, indeed, of not running any risks, the directors adopted the principle of fixing their sale prices for American material almost always in dollars. Thanks to the co-operation of their New York friends, who endeavoured to spare them this injury, and who understood that the exorbitant rise in exchange could not fail to be seriously prejudicial even to the United States by rendering exports more and more difficult, the French company had been able to carry through successfully an important credit transaction in dollars for a period of five years. It was hoped that in the course of this period the improvement in the public financial situation would permit both the company and its customers to pay off the debts under conditions which were less onerous than those existing at present.

After referring to the previously announced programme for the organisation and extension of the different works, the report stated that the work was being pushed forward as actively as possible, having regard to existing difficulties. The investigation services, centralised and reorganised, had devoted their attention to the standardisation of the constituent parts of the company's manufactures, particularly production in bulk, in order to increase the output and reduce prices. They had developed the study of large alternators up to 25,000 KW., transformers of 15,000 KW., and pressures up to 120,000 volts; high-tension apparatus, motors and apparatus specially intended for the equipment of Rumanian oil wells, and new ventilated motors for tramways. Special attention was also paid to the study of plant for the electrification of the French main railway lines, and the technical co-operation of the General Electric Co. was assured, as being infinitely precious in the case of all this special plant

and the organisation of its manufacture. Passing on from details of the various sales departments and the orders received, the directors stated that several large schemes in which they were co-operating were under examination, including the proposed installation of electric haulage on the canals of the Marne to the Rhine, extending over 217 miles. Concerning the projected electrification of various French railways and the conclusion reached to adopt the high-tension direct-current system as being the most suitable on main lines, the directors mentioned that this was the conclusion which they themselves had maintained for years past in agreement with the General Electric Co. The complete experience which the American company possessed of the construction and working of plant of this type would place the French company in a favourable position when the time arrived for the realisation of this great enterprise.

M. Charles Laurent, chairman of the company, addressing the shareholders at the recent annual meeting, referred at some length to the question of coal and coal prices and to the situation of England in this respect. If it was necessary for us to economise in the consumption of coal, he submitted that it was all the more essential for France to do so, seeing that her coal resources were extremely limited. It was necessary to substitute for coal other fuels as far as possible, as, for instance, mazout and petroleum, but the future salvation of the country lay in the utilisation of white coal—this source of inexhaustible energy which was offered by the mountains, the torrents and the rivers over a large portion of the territory, and which it was only essential to collect in order to serve the needs of industry, agriculture, transport and large centres of population. The company was particularly well situated for taking a large share in the execution of this great work.

In conclusion, the chairman paid a warm tribute to the French soldiers for having driven back the German hordes, and for now having given the same answer—*On ne passe pas*—to the new enemy which had risen before them, namely, revolution, anarchy and Bolshevism.

An Imperial University?

OUR comments on this subject, in our issue of June 11th, have brought us a letter from Mr. F. Peake Sexton, which will be found in our "Correspondence" columns to-day. The letter is charmingly inconsequential. Having demonstrated, to his own satisfaction, that the University of London does not fulfil our ideal, our correspondent invites our support for the claim of the Imperial College of Science and Technology to rank as a university. But "two blacks do not make one white"; he has not met our case in the least, for his argument, if well founded, merely shows that the University of London, like the Imperial College, ought *not* to rank as a university.

However, his argument, or rather his contention, is not well-founded. Whether our views with regard to the functions of a university are "slowly dying out" or not is a matter of opinion, which we need not discuss, but the extent to which the University of London fulfils our ideal is a question of fact, and we happen to possess exceptional opportunities of knowing the facts in this connection. Mr. Sexton himself admits that the cultural facilities for which we contend "may be found" in some of the "recognised schools" of which the Imperial College is one group; we know that it *is* found in the constituent Colleges of the University, some of which are seething with social and intellectual activity, outside the class-rooms. The handicaps under which the University labours—widely scattered colleges, lack of funds, and that worst handicap of all, its situation in a city so vast that the residential suburbs are remote from one another and from the Colleges—hinder it from attaining the efficiency in this respect that can be justly claimed by most other universities; but steps are being taken to remove such of these disadvantages as are capable of removal, and even now there is a striking contrast between the social amenities of the constituent colleges of the University and those of the Imperial College. At work, the latter is unrivalled; at "play"—the play that cultivates the best qualities of a man, or woman, as no course of study can do it—it is literally not in the running.

But it was not, and is not, our aim to champion the cause of the University, which is well able to look after itself; we asked, quite explicitly, whether the Imperial College, if granted a charter, would undertake to become a university in fact as well as in name, and we have had no answer. As Mr. Sexton says:—"Here we have a large group of colleges combined for the purpose of technical education"—and they fulfil that purpose exceedingly well. But that is all.

Incidentally, we may note that Manchester University is experiencing a difficulty of similar origin but different nature. The College of Technology, originally established by the Corporation for Technical Training, has become the Faculty of Technology in the University of Manchester; it has earned a high reputation, and there are so many candidates for the degree course that, as reported in our last issue, the Education Committee has found it necessary to limit the number in order to leave room for the local technological students who do not aim at the degree.

The incident illustrates the intensity of the modern demand for scientific training in both categories, and the only right solution, to our mind, is to provide accommodation sufficient for all comers in our educational institutions.

Price Dictatorship in Germany.

A SHORT time ago Herr Walter Rathenau, addressing the shareholders at a special meeting of the A.E.G., referred in strong terms to the enormous prices charged for raw and semi-finished materials, and remarked that they were living under the dictatorship of the heavy industries, meaning the coal and iron and steel industries. Since then various German newspapers have taken up the challenge on behalf of the heavy industries, but the best statement on the subject probably is that which has just been published giving a comparison of the A.E.G. list-prices early in 1914 and in 1920. The figures are of such interest as to be worthy of being set out prominently. They are as follows:—

A.E.G. LIST-PRICES IN 1914-1920.

	Marks.	Marks.	Percentage addition over 1914.
Normal rotary-current motor of 20 H.P.	1,100	28,362	2,478
Normal rotary-current motor of 40 H.P.	1,600	39,270	2,354
Normal rotary-current motor of 50 H.P.	1,800	44,968	2,398
Direct-current motor of 16 KW. and 1,400 revolutions	1,000	26,180	2,518
Direct-current motor of 40 KW. and 1,050 revolutions	2,000	59,290	2,865
Osram lamp of 1,000 C.P., 90 to 260 volts	8·65	245	2,733
Dynamo wire (per ?)	2 to 3	70 to 80	3,000

The percentages are given from the original statement, and have not been checked. On the other hand, the prices of coal between 1914 and the present time have been raised by 1,550 per cent., coke by 1,600 per cent., pig-iron by 3,300 per cent., and steel ingots by 3,600 per cent. Included in the price of coal are burdens which are beyond the control of the colliery owners. Thus, there are the 20 per cent. *ad valorem* tax imposed upon the production of coal, the tax on the turnover, the tax of 6 marks per ton to defray part of the cost of providing miners' dwellings, and the additional expenditure for the payment of special overtime rates to the miners. All these causes re-act upon the prices of iron and steel, apart from the fabulous prices which have to be paid for Swedish and other foreign ores. Moreover, the prices of coal and iron and steel are under the public control of the Federal Coal Board and the Federation of the Steel Industry, which have been created by the Government, and which include representatives of both consumers and workmen. Such control, however, does not exist in the electrical industry, and so long as this kind of regulation is absent it is considered that Herr Rathenau has the least justification of all to speak of dictatorship in the heavy industries.

THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION.

The Annual Convention at Ilkley.

THE Convention of the I.M.E.A. this year opened under the most favourable conditions that could be wished for. The headquarters, at Ilkley, were situated in one of Britain's most famous beauty-spots in Wharfedale, the heart of the Yorkshire moors, a district which afforded an abundant choice of enjoyable excursions for those on pleasure bent, while its midland situation rendered it comparatively easy of access from all parts. Regarding the site from an industrial point of view, it is interesting to note that Bradford, which as the President's "home town," was the determining factor in the choice of venue, was one of the first English municipalities to embark on the business of electricity supply; the original power station at Bolton Road, which commenced public supply in 1889, was, in fact, the first of its kind to employ direct-coupled engines and dynamos, and it is amusing, in the light of modern developments, to record that the plant comprised three sets of 81 KW. and two of 125-KW. output, all, of course, being bipolar machines. Since those early days two other stations have been erected at Valley Road, in 1897 and 1902 respectively; the former was but a modest step in advance of its prototype, the largest set being of 375-KW. output, but the third station contained sets of 1,000 KW. each, and was typical of the final stage of development of the direct-current power station. Much of the D.C. plant is still in use at Valley Road, but the rapid increase in the demand for power in Bradford, led to the inevitable change of system to three-phase generation. Mr. T. Roles came into office as chief electrical engineer and manager in 1912, and under his control the undertaking has been developed on up-to-date lines, the plant now including turbo-alternators of some 30,000-KW. capacity, of which the largest set is rated at 15,000 KW.—with another of the same size on order. The station forms an epitome of the progress of steam generating plant, examples of bipolar high-speed and multipolar low-speed D.C. generators, and both vertical and horizontal, Curtis and Parsons, turbo-alternators being at work together.

The Convention, which commenced with an informal reception and social evening at the Winter Garden, Ilkley, on Monday, was formally inaugurated on Tuesday morning at the Queen's Hall, "The Windsor," Bradford, when the Lord Mayor, Alderman Wm. Wade, J.P., extended a hearty welcome to the Association. He said that Bradford claimed to be the first local authority to use powers to supply electricity, in 1889. Mr. Roles returned thanks and then delivered his address, of which an abstract follows.

The leading feature of the address was his commentary on the recent and pending legislation with regard to electricity supply. Incidentally, Mr. Roles referred to the removal of the obstacle which has hitherto restricted the attendance of representatives of local authorities at the Convention, a concession which was certainly long overdue, and which should not only prove helpful to the Association, but should also facilitate attendance at various other gatherings in the public interest. Mr. Roles endorsed the complaint of members of the Association that the powers to carry on the hire-purchase system and to sell apparatus outright, for which they have long yearned, had not been granted by the Act, and expressed the hope that these additional powers might ultimately be secured by agreement with the Electrical Contractors' Association. His natural optimism is here revealed; we hope it will be justified by the event, but at the moment the prospects of the attainment of that desirable consummation seem remote.

Turning to the major theme, Mr. Roles plumps for the compulsory and financial clauses of the new Electricity Bill, although he complains that municipal authorities in general are singularly indifferent to the matter, and some are openly hostile to the Bill. He admits that the terms of purchase might with advantage be amended, a view with which we cordially agree, and which, we think, will find few objectors; but he is not disposed to allow the compulsory powers of purchase to be dropped, or even delayed. His contention that such powers are indispensable, in order to coerce recalcitrant authorities, "either municipal or private," as he says, is one that we ourselves advanced when the Bill of 1919 was before Parliament; we are, however, inclined to sympathise with those who hold that the existing Act should be given a trial before any further legislation on these lines is enacted. The Commissioners have their hands full already with schemes in active progress; a considerable time is likely to elapse before they feel the need of compulsory powers of purchase, and in that time valuable experience will be gained on which to base legislation. Purchase by agreement is already authorised under the Act of 1919, and is free from the objections justly raised to the terms of purchase that were foisted upon the companies in the original Bill. Apart from the question of purchase, voluntary co-operation in the establishment of Joint Electricity Supply Authorities is producing valuable results, and is very much to be preferred to compulsion. It may be that considerations such as these are at the root of that municipal indifference to the new Bill which Mr. Roles deplores.

The financial clauses, however, stand on a different footing. Finance is the stumbling-block in the path of the progress of the embryo Joint Authorities, which, unlike the individual municipalities, have not the rates at their backs. No such authority can mortgage the rates of any of its constituents, some of which, moreover, will be private undertakings. Nor can it even pledge the plant and mains of the undertakings which it controls. It will be impossible for Joint Authorities to raise the necessary capital for any developments outside the constituent undertakings, under the existing conditions. We are of the same mind as Mr. Roles that Government ownership and control of power stations and mains would be in the last degree unwelcome and contrary to the public interest, but that the provision of funds for the purposes of the Joint Electricity Authorities is a vital necessity, and, as he says, the financial clauses are the most important part of the amending Bill.

It is interesting to learn from the address that the Association is likely to appoint a salaried secretary and to secure suitable office accommodation. We were pleased to see that Mr. Roles commended the E.D.A. to the attention of the members; seeing that the great majority of electricity supply undertakings in this country are in municipal hands, and that the operations of the E.D.A. are directed towards the increased utilisation of electricity, it is obvious that the I.M.E.A. is in duty bound to give its whole-hearted support to the Electrical Development Association.

A vote of thanks to Mr. Roles was moved by Councillor Barge, of West Ham, who eulogised the work of the President for the Association, especially during the past year. Mr. Gillin read his paper in abstract, after which Mr. Roles presented the author with a Premium in the form of a stop-watch. A lively discussion followed, in which Messrs. Wordingham, Staniland, Ayton, Bell, Fedden, Purse, Watson, Brooking, Webber, and Ferranti participated. Later the Association was entertained to luncheon by the Bradford Electricity Committee. Councillor Wilfrid Turner, the chairman, presided. Alderman Sinclair, Mayor of Swansea, proposed the toast, "The City of Bradford," and the Lord Mayor responded. Mr. Chattock, formerly city electrical engineer there, proposed the health of the chairman, who duly responded. The delegates proceeded by char-à-bancs to the Phœnix Works of the English Electric Co., where they were entertained to tea. Mr. Roles expressed the members' thanks, and Mr. Pybus, joint-managing director, acknowledged. The Corporation electricity works were then visited. After returning to Ilkley there was a reception by Councillor Dixon, chairman of the Urban Council, at the Winter Gardens. In this very enjoyable function singing, dancing, and light refreshments each had a place.

Up to the time of writing, the weather has been fine, and the Convention has proceeded successfully in every way.

Presidential Address.

By THOMAS ROLES (City Electrical Engineer and Manager, Bradford). (*Abstract.*)

As far as the electricity supply industry is concerned, the past year must for ever remain memorable, as during its course the Electricity (Supply) Bill received the attention of both Houses of Parliament, and the Electricity (Supply) Act, 1919, which resulted, came into operation. This Act has been well referred to as "the great charter of electricity," and it cannot fail to have far-reaching effects on electricity supply in the British Isles.

Many of the provisions of the Act give powers which the Association has itself for years laboured to secure, and a number of such powers have been obtained directly as the outcome of the efforts of the Association's Council. Representatives of a number of local authorities are for the first time attending the Convention without fear of their reasonable expenses being questioned by a Government auditor. The removal of the disability which previously existed as regards subscribing to associations has been of distinct advantage to the Association, in that its membership has increased during the year as a result, and under the circumstances now existing it is to be hoped that no municipal electricity supply undertaking will fail to avail itself of the advantages which membership of the Association affords.

As regards the section of the Act which authorises the supply of apparatus on hire, considerable disappointment has been expressed by many members of this Association that the powers given are restricted to the hiring of such apparatus, as it is considered that powers to provide apparatus on the hire-purchase system and to sell outright are very necessary in the interests of municipal undertakings. Personally, I have every sympathy with these views, and consider that such powers, if given, could be utilised for the benefit of consumers of electricity, electricity supply undertakings, electrical manufacturers, and electrical contractors; and I sincerely hope that in the course of time the relations between the Electrical Contractors' Association (Incorporated) and this Association may become such that some agreement may be reached under which a successful attempt may be made by municipal electricity supply undertakings to secure powers for hire-purchase and sale, to be utilised under certain agreed conditions which may be recognised by the electrical contractors as reasonable and just, and as being likely to advance rather than in any way to militate against their interests.

It is a matter for regret that the Government found it necessary, in order to save those portions with which more or less general agreement had been expressed by the whole of the electrical industry, to withdraw certain clauses from the original Bill. This regret, I am aware, is not shared by a large number of those who are connected with the industry, who are of the opinion that the Act as it now stands is sufficiently comprehensive for all practical purposes, and that its provisions should be given a trial prior to any further legislation on electricity supply matters being promoted. The Government, however, and it must be remembered that the Government has now the advantage of the advice of the Electricity Commission, appears to be of the opinion that it is desirable that the whole of the powers sought under the original Bill should be obtained. The clauses in the new Bill may be divided into two groups, those in the first of which have for their object the setting-up of District Electricity Boards and the compulsory acquisition of generating stations and main transmission lines belonging to existing electricity supply undertakings; the clauses in the second group, usually referred to as "the financial clauses," have for their object the empowering of the Joint Electricity Authorities which are to be constituted under the existing Act, as well as the District Electricity Boards contemplated under the Bill, to borrow moneys, and to authorise the issue of stock. They will also allow authorised undertakers to give financial assistance to Joint Electricity Authorities and District Electricity Boards, and the Electricity Commissioners, under certain circumstances, to lend money to such authorities and boards.

From the point of view of the electricity supply industry the financial clauses may be said to be the most important, as it has become clear to all who have been considering the setting-up of Joint Electricity Authorities that the financing of such authorities is impracticable until some such provisions as are contained in the clauses in question are made.

With regard to that part of the Bill which concerns the setting-up of District Electricity Boards and the compulsory acquisition of generating stations and main transmission lines, it appears to me that, although in many cases such powers may not prove necessary, yet it is essential that the Commissioners should be provided with them, as otherwise it is difficult to see how the Commissioners are to enforce the carrying-out of a desirable scheme in face of unreasonable opposition which may be experienced from one or more electricity undertakings in the district to which such scheme is to apply. As things are at present, it would appear that one unreasonable electricity supply authority might hold up for a considerable time, or even permanently, a scheme which would be to the benefit of the consumers of electricity in a very large area. In view of the general satisfaction which has been expressed throughout the country with the appointments which have been made to the Electricity Commission, I consider there is no reason why the Commissioners should not be furnished with the powers necessary to enable them to enforce the carrying-out of proposals which they deem to be in the public interest. It is possible that the terms of compulsory purchase, as set forth in the Bill, may, with advantage, be to some extent amended, but I think it will be generally conceded that provision should be made under which generating stations and main transmission lines may, under certain circumstances, be compulsorily acquired.

As a private citizen having some knowledge of the subject I hold that the provision of an adequate supply of electricity at the cheapest possible price is an absolute necessity to the welfare of this country and its inhabitants, and I should not be prepared to allow any interest, either municipal or private, to stand in the way of such an adequate and cheap supply being furnished. As President of this Association and chief officer of a municipal electricity supply undertaking, it is my duty to ensure as far as possible that municipal interests are conserved and furthered.

In the light of these remarks, I feel that on general principles the Bill before Parliament should command the support of local authorities. Of the two noble lords who first opposed last year's Bill on its being introduced into the Upper House, one is a director of certain electricity supply companies, and the other was very recently the President of the British Commercial Gas Association. Having in view the sources from which opposition to the measure emanated, I think local authorities would not be wrong in coming to the conclusion that last year's Bill, including the clauses which were deleted, was one which on the whole might be regarded as in no way inimical to their interests. If such conclusion is come to, it follows that municipalities should look with favour on the Bill at present before Parliament, but up to the present there seem to be few signs that this Bill is receiving any great amount of support from local authorities. I would suggest it is high time that municipalities and the Associations representing them came to some decision with regard to this matter, and defined a policy which their representatives and officials may pursue on their behalf.

It has been put forward as an objection to the formation of Joint Electricity Authorities and District Electricity Boards that, in view of the heavy financial liabilities which municipalities are having to incur in connection with housing and other matters, they cannot be expected to incur further responsibilities of this nature by financing electricity supply schemes. It is, I think, advisable to consider the probable result should this attitude be generally taken up. The very great demand for electricity which is now being made must be met, and the Government has apparently rightly determined that it shall be met. If the principle of public control is to be given effect to, this must be done either by schemes financed by the Government or by municipal bodies individually or in association. It appears quite clear that under present circumstances the Government is not in a position to finance such schemes, and were it able to do so I think it is generally felt that Government control of the generation and main transmission of electricity would not be in the interests of the community. If the Government will not or cannot supply electricity under a national scheme, and municipalities object to carry out the work by reason of the financial risks involved, the only alternative of the Government will be to hand over the task of the development of electricity supply to private enterprise.

Personally, I cannot bring myself to believe that grounds for serious apprehension with regard to the financial position exist. The Engineering Commissioners are gentlemen fully acquainted with the principles underlying the giving of supplies of electricity under conditions which are likely to prove satisfactory from a financial point of view, and one cannot conceive that they would urge any authority to embark on any rash scheme, or sanction the carrying-out of an unsound scheme put forward by any such authority. Moreover, one of the Commissioners has been specially appointed to give attention to financial matters in relation to electricity supply, and, therefore, one may expect him to place his veto on any scheme the financial aspects of which may appear to him unsatisfactory.

To my mind the principle underlying the legislation which has been enacted and which is proposed is as follows:—

A great demand for supplies of electricity is being made throughout the country, and this demand will be an increasing one. The supplies can be given by existing authorities acting for the most part individually as they are doing at present. If, however, such authorities will co-operate or amalgamate in order that electricity may be generated on a larger and more efficient scale, cheaper and more reliable supplies should be available than if individual generation is continued.

The situation would probably be best dealt with in the following manner:—

Immediate demands for electricity must in the national interest be met, and this will for the time being entail the extension of many existing generating stations, whether good, bad, or indifferent. Generating stations in reasonably close proximity to each other should be linked up by main transmission cables, and on this being accomplished the most efficient stations of those so linked would naturally, for economic reasons, be called upon to meet the greater part of the demand, the least efficient stations being operated for as short periods as possible. As far as practicable extensions should only be allowed in connection with the most efficient

stations. Where and when the demand renders it necessary, a capital station should be erected and equipped for the provision of the supply required in the district, instead of several smaller generating stations being erected, each of which would supply the needs of one particular distributing area only. On the capital station being put into commission it should, owing to its efficiency, be run at a high load factor. The most efficient of the previously existing generating stations would be run at moderate load factors, and the smaller and less efficient stations would only be utilised at peak load periods or otherwise would be entirely dispensed with. On these lines an efficient system of generating electricity would be gradually evolved, which should tend to cheap production and reliability of supply, and at the same time the capital already sunk in the industry would for the most part continue to be utilised to full advantage.

As far as one is able to judge from decisions which the Electricity Commissioners have from time to time been reported to have made, it is on these lines they are proceeding.

It is somewhat remarkable that power companies seem to be expressing no fear of taking the financial risks involved in supplying electricity over large areas; on the other hand, they appear eager to accept such risks, and I have little doubt in many cases would be prepared to relieve municipalities of the financial responsibility regarding which some are so apprehensive.

I would, therefore, repeat that it is for municipal authorities to decide upon the line of action they intend to pursue, both with regard to the new Bill and the formation of Joint Electricity Authorities, and that their decisions should be come to without delay, as, if public control of the supply of electricity is desired, there is unlikely to be a better time than now for obtaining it.

The Design of Distributing Networks.

BY C. A. GILLIN, A.M.I.E.E. (Bradford Electricity Department). (*Abstract.*)

PRACTICALLY all generating stations (in the United Kingdom) have been at one period of their evolution the sole distributing centres in their areas of supply. In the larger areas they have been superseded by larger generating stations and by virtue of their positions they have automatically become distributing centres for their respective districts.

The objects to be aimed at in designing distributing networks are: (1) Economical service and distribution; (2) continuity of supply; (3) satisfactory operation; (4) minimum expenditure on repairs.

I (*a*). E.H.T. DISTRIBUTION.

In figs. 1 and 2 the four squares A, B, C, D represent diagrammatically four districts in a supply area having a reasonably uniform density of load, the centre of each being at the points ×, and to represent scattered districts one merely thinks of the squares as being separated by as many miles as their boundaries are apart.

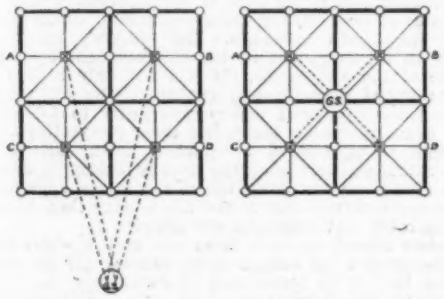


FIG. 1. FIG. 2.

Taking into account the cost of switchgear, number of transformer chambers per mile and their average K.V.A. demand, the most economical distribution pressure from 1 mile up to about 5 miles radius is 6,000 volts and up to about 8 miles radius is 10,000 volts. In order to show how the high cost of switchgear for use at higher pressures overbalances the reduction in cost of cables, the curves shown in fig. 3 have been prepared.

Comparison has been made between 6,000 volts and 30,000 volts distribution, because the majority of stations are already using the former, although 10,000 volts would have shown results more favourable to the lower pressure at a greater radius of distribution than is shown with 6,000 volts. The higher values of the curves are of no particular importance, as the radius of distribution of a main distributing centre would seldom exceed 4 miles. The curves are based on the following data: No duplicate cables; all cables split-conductor type; transformers and buildings not included; average capacity of transformer chambers 250 K.V.A.; three switchgear cubicles in each chamber; total permissible pressure drop on cables 7½ per cent.

If the situation of a generating station is such as to allow of its later use both as a station for the economical generation of large supplies of energy and as a distributing centre for its immediate district, the voltage for the latter purpose should be from 6,000 to 10,000; but for even comparatively short distances the most economical voltage for the transmission of reasonably heavy loads from the generating station to distributing centres in other districts will be 30,000 volts or more. The curves shown in fig. 4 illustrate this fact. The figures upon which the curves are based are as follows:—

The total permissible pressure drop (including transformers) is within 10 per cent.; all transmission losses have been neglected, the figures being only capital outlay; step-up and step-down transformers are included in the 30,000-volt curves, but no transformers are necessary in the case of 6,000 volts; only 6,000-volt switchgear has been provided for, it being assumed that transformers and cables will be treated as one complete unit for each 30,000-volt line; one spare cable and the necessary transformers have been allowed for in each instance considered. In all curves and data in this paper present-day prices form the basis, with copper at £125 per ton, lead £40 per ton; cables unarmoured, taped, laid direct under average roadway conditions.

If the correctness of the above principles be conceded, the logical deduction is that a supply area would ultimately resolve itself into a number of districts whose boundaries should be a maximum distance of approximately 5 to 8 miles from their respective distribution centres; the latter (unless themselves generating stations) receiving the requisite supplies from a generating station and transforming down to a pressure of from 6,000 to 10,000 volts for district distribution.

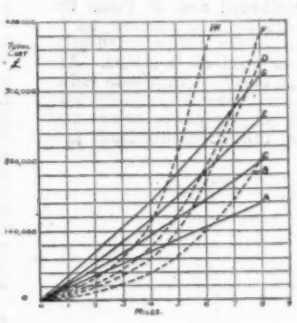
This splitting-up of a supply area into constituent districts will be a natural process consequent upon the size of the existing cables connecting the districts to the sources of supply having become inadequate to cope with the increased demands.

The distributing centres will not necessarily be near the centres of their respective districts, as their positions will be determined by power demands in unexpected directions and their strategic value for directional distribution.

The lay-out of the E.H.T. distributing network is intimately bound up with the question of the section of the cables, the system of electrical protection from the effects of faults, the satisfactory isolation of the faulty apparatus, and the maintenance of the continuity of supply despite breakdowns. The early provision of an adequate number of telephone lines for point to point communication is a factor of importance.

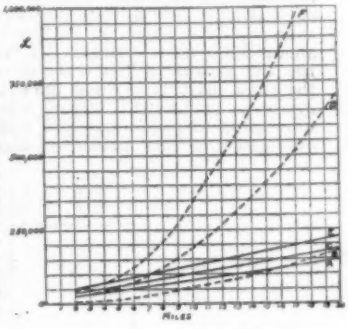
All feeders as soon as possible after leaving the source of supply should be laid along different routes. After a few years they become a united fmaily again and the network is thus created. All future extensions must be made with one eye on finance, the other on potential consumers, and the mind on prospective distributing centres. Unfortunately, good finance often means bad engineering (in distribution schemes), but this could and should be altered by judiciously increasing the tariffs for electrical energy. Supply undertakings are inclined to be too philanthropic, except to their employés.

When the early outgoing feeders are visibly approaching the limits of their carrying capacities is the time to spend a lot of money wisely for future requirements. And here lies the advantage of building up a considerable reserve fund instead of allocating a mythical "surplus" towards the reduction of rates. This is the time to establish distributing centres and give some of them, via new transmission lines at 30,000 volts or more, a "cheap and abundant supply," at the same time linking-up or cross-connecting to other districts until it becomes necessary for these in their turn to be augmented by similar means. Thus we reach the scheme shown diagrammatically in figs. 1 and 2, where the squares A, B, C, D represent districts each of about 16 square miles area, × represents the distributing centres, G S the generating station, and all intersections or junctions of lines substations, transformer chambers, or switching chambers.



– – – – 6,600-volt system.
——— 33,000-volt system.
Transformer chambers per mile, curves A and B, 4; C and D, 6; E and F, 8; G and H, 10.

FIG. 3.—TOTAL COST OF DISTRIBUTION AT 6,600 AND 33,000 VOLTS.



– – – – 6,600 volts.
——— 33,000 volts.
Power transmitted, curves A and B, 1,000 K.V.A. C and D, 5,000 K.V.A.; E and F, 10,000 K.V.A.

FIG. 4.—COST OF TRANSMISSION AT 6,600 AND 33,000 VOLTS.

In the early days practically all cables laid were too small, chiefly perhaps because of difficulties with regard to capital expenditure; the practice should not be repeated. All cable sizes should be decided more by the dictates of experience than as the result of calculation. The only limits to the sizes of cables between generating stations and distributing centres should be those due to difficulties in handling, desirability of duplication, limitation of reliability of switchgear operation under extraordinary loads, and financial checkmates.

The sectional area of network cables will depend upon their position relative to the other portions of the network, and on the loads they may be called upon to carry in the event of faults on neighbouring or co-related cables. It is generally uneconomical to load up cables to their safe carrying capacity. The curves in figs. 5 and 7 give an interesting illustration of the extent to which cables may be safely loaded. The results shown should be used discreetly for A.C. pressures higher than 400 volts, as L.T. A.C. currents were used in determining the curve values, and allowance must be made for heating due to energy loss in the dielectric. The curves in fig. 5 shows the temperature rise due to a steady current of uniform value, and those in fig. 7 have been obtained by increasing the current in any particular cable in successive stages after the

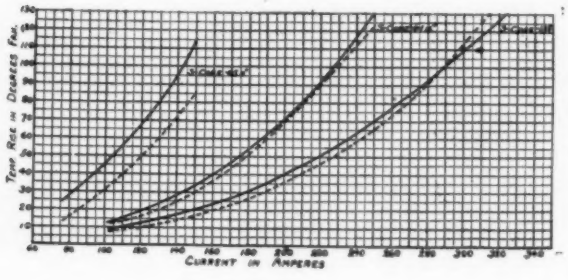


FIG. 5.

temperature due to the current value in the immediately preceding stage had ceased to increase. Each of the latter readings involved a run of several hours before the temperature became steady, and the tests occupied three weeks. There was only one three-core cable used in each test, so that the results require adjustment where two or more loaded cables are laid near each other.

The system of protection should be the first point to be tackled, instead of—as it often is—the last. Effectual protection is one of the most important items in the whole undertaking.

The Merz-Price, the split-conductor, and the Hunter-Beard compensated pilot appear to be the only well-tried systems of protection which fulfil the conditions; and of these the split-conductor seems to be the best for our purpose up to about 20,000 volts. Beyond this voltage the compensated pilot has the advantage if it turns out as good as it seems. Are the extra advantages worth the extra cost? A duplicate radial system of mains, with tees off wherever necessary, judiciously interlinked at points provided with reverse power relays and equipped wherever necessary with time-limit overload pro-

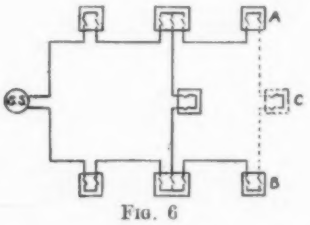


FIG. 6

tection, with, generally, the transformer chambers and sub-stations divided between the two feeders, has been and still remains a popular arrangement. Its disadvantages are small having regard to the infrequency of E.H.T. faults, and in practice lie in the fact that perhaps once in five or six years half the consumers connected to a feeder have their supply cut off for an hour or so until they can be changed over to the duplicate feeder. Until a very few years ago our experience was that most of the supply interruptions were due to faulty protective apparatus, particularly in the case of reverse power relays, but these drawbacks no longer apply if discretion in the choice of suitable instruments be employed.

The greatest asset in the claim to superiority of the balanced-current or split-conductor system of protection is the fact of the non-interference of cable faults with the continuity of supply. This fact, of course, presupposes the completion of all the interconnections necessary to ensure a supply being available from another cable at all sub-stations and transformer chambers. The reliability of modern cables, however, is so great that one is quite justified in taking, and is, indeed, generally economically compelled to take, the small risks of temporarily supplying via only one cable with a view to interlinking later when the opportunity presents itself. This position is illustrated diagrammatically in fig. 6 at A and B, with C as a prospective means of completing the cycle.

In order to compare the costs of complete networks constructed to operate under these two systems, *i.e.*, the duplicate radial system and the split-conductor system, a typical district approximately 16 square miles in area, commencing at a line one mile from the centre of a city and extending outward, has been examined. Definite positions for transformer chambers at distances averaging ½ mile apart and 6,000 volts distribution have been assumed. Account was only taken of excavation, reinstatement, cables, their mechanical protection and jointing, feeder switchgear, and protective apparatus in transformer chambers. Buildings and the remaining transformer-chamber equipments have been left out. As a fair comparison two 3-core 0.05 cables, unarmoured, taped and with copper earth sheath in the one case, and one 3-core 0.1 sq. in. split-conductor cable, unarmoured, taped and without copper earth sheath in the other case, were taken. The resulting costs approximated so closely in the two cases that financial considerations do not at all enter into the discussion

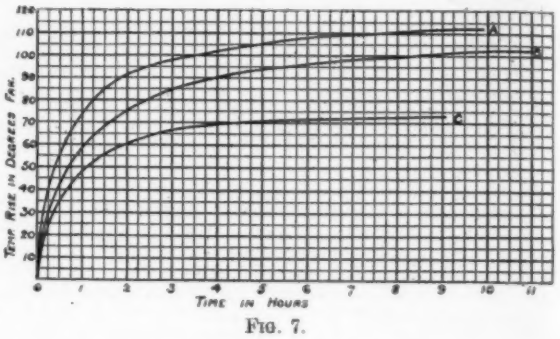


FIG. 7.

as to which system is the better to adopt. In fact, by changing about the assumed positions of transformer chambers either system can be shown to be slightly cheaper than the other.

I (*b*). MEDIUM-PRESSURE A.C. AND D.C. DISTRIBUTION.

Medium-pressure supply areas are now always divided up into districts, which may be called feeder areas, a feeding point or transformer chamber answering the same purpose and performing the same functions in a minor degree as the distributing centres referred to in section 1 (*a*). Each district is connected with its neighbouring districts through a number of fuse pillars. Most municipal supply areas have a good deal of productive capital sunk in D.C. networks of very heavy density within a reasonable distance of the original generating station. As the demand for energy increases, and more economical and larger units of plant become practicable, generation is of necessity by turbo-alternators, which replace gradually the smaller machines. The tendency will be to narrow down the D.C. areas by the encroachment upon their boundaries of the A.C. mains. It will not only be found a sound commercial proposition to encourage this A.C. advance by a reasonable lopping-off and changing-over to A.C. of the extended arms in the D.C. areas, but these prospective alterations should be anticipated by putting down suitable distributing mains and arranging the local balancing in advance whenever extensions are made where this seems appropriate. The subsequent change-over to the A.C. system then becomes both inexpensive and comparatively simple.

D.C. feeders should not be of large size except where necessary to compensate for voltage drop, because (1) the supply to an area having its feeder out of commission has to be maintained by the distributors of its own and its adjoining areas in addition to their own load; (2) disturbance is more circumscribed in the event of feeder troubles; (3) the distribution voltage is more uniform. For these reasons also the radius of a feeder should be extended or reduced according to the density of its load, and any later adjustments rendered necessary to cope with increased loads may be met by putting down another feeder and creating an additional feeder area. These remarks apply equally to the capacities of sub-stations, transformer chambers, and transformer pits in the case of the A.C. areas.

In the matter of individual feeder areas, the following observations are applicable both to D.C. and A.C. systems of supply.

Every proposed extension must be carefully considered as to its bearing on all other parts of its own and adjoining feeder areas. Arterial cables leaving a feeding point must have ample provision not only for carrying their own local loads, but also for any supplementary loads they may have imposed upon them in consequence of the failure of another arterial cable or a feeder supplying an adjacent area. The number of cables radiating from a feeder point should be as large as possible, and each of them should feed a small section of

an area, the said section being controlled by a heavy fuse at the feeding point and connected to adjoining sections of the same area and to neighbouring areas through sectional fuse pillars in which the fuses are carefully graded to suit their local obligations. Between these points network disconnecting boxes, switch pillars, and other fuse pillars should be inserted at strategical intervals. Intelligently followed out, these provisions will restrict to a minimum the inconveniences due to faults, facilitate the quick restoration of healthy circuits, and allow of comparatively rapid location of "earths" and other troubles.

It would be a good plan to provide a sum annually out of revenue to be used for the sole purpose of converting into a decent engineering job those cases where capital expenditure is curtailed in order to make an extension to a prospective consumer a paying proposition. The use of a provision of this sort should be exercised with careful discretion, but it would certainly be of great advantage to be able to propose a scheme for approval at a specified cost, with an addition from such a fund for engineering purposes.

A limited range of cable sizes should be definitely standardised for all the above purposes. For feeders two sizes, viz., 0.5 sq. in. and 1.0 sq. in. sectional area, with a smaller neutral for D.C. districts, should be sufficient, keeping in mind the desirability of increasing the number of feeders rather than their carrying capacity. Pilot cables are sometimes not very satisfactory when laid up under the same sheath as the feeder cables, but several instances have occurred where they have saved very inconvenient interruptions to district supplies by indicating incipient faults before these have affected the cores of the feeder. For this reason, amongst others, pilot wires should always be protected by a light fuse at the feeding point as well as at the station.

For distributors, sizes varying from about 0.3 sq. in. to 0.05 sq. in. sectional area in four stages should be adopted, the existence of the smaller sizes being forgotten wherever possible. A smaller neutral would, of course, be used on D.C. networks but not on A.C. networks, as it must be remembered that an out-of-balance on the two systems has not always the same effect in the neutral cable. The same sizes, with the range extended to a minimum of 0.022 sq. in., would also be used for services. It seems hardly worth while considering a smaller size than 0.022 sq. in. nowadays when the size of the house is no longer an indication of the affluence of the resident.

(To be concluded.)

THE KEEPING OF BATTERY RECORDS.

Accumulators, although necessarily only a minor part of most generating stations, are nevertheless very important articles, and unless accurate records are kept of them it is very unlikely that the best possible results will be obtained from them. The study of accumulator behaviour is almost a science in itself, and one which a large number of engineers are inclined to treat somewhat lightly. Of the value of complete records of the behaviour of accumulator batteries there can be no doubt; indeed, practically all the leading battery manufacturers who guarantee their goods demand that full records be sent to them regularly in order that they may watch very carefully the life of the cells themselves, and in many cases they are able, by this method, to prevent serious damage to the battery.

When keeping records of accumulators it is well to remember two things: one, the record should show at a glance everything of importance, and two, everything that is not of importance should be left out, as it only occupies valuable space and helps to confuse the issue. We can now ask ourselves what records are necessary in order that the engineer may see clearly what is taking place in the battery. A suggested form of log sheet is shown in fig. 1; readings should be entered on this every half-hour. From it we can see at a glance the exact condition of the battery. We can see whether it is charging or discharging, its capacity in ampere hours, and the rate of charge or discharge. As it is impracticable to test each cell in the battery every half-hour, we can select one cell as the "pilot cell," and its condition as indicative of the condition of the remaining cells. The voltage, specific gravity, and temperature of this cell are noted every half-hour, and from these readings we can get a very accurate conception of the condition of the battery. In very large batteries two, or even more, cells may be used as pilot cells.

In addition to the pilot cell readings, however, a careful examination of the battery should be made every night at a specified time (preferably when the load on the station is at a minimum). These readings should be entered in the "Individual Cell Readings," columns, and upon the voltage or specific gravity of any cell varying from the average, a careful investigation of its condition can be made. A record of all work done on the battery should be noted in the remarks column. Special log sheets could be printed for the battery only, but the better way is to embody it in the station log sheet.

TIME.	CHARGING OR DISCHARGING.	RATE OF CHARGE OR DISCHARGE AMPS.	PILOT CELL No			PILOT CELL No.			AMP. HR. METER.	AMP. HRS. CHARGED.	AMP. HRS. DISCHARGED.	INDIVIDUAL CELL READINGS.		
			Volts.	Sp. Gr.	Temp.	Volts	Sp. Gr.	Temp.				Cell No	Sp. Gr.	Volts.

Fig. 1.—Suggested Form of Battery Log Sheet.

LEGAL.

Stobie *v.* Newcastle-on-Tyne Electric Supply Co.

(Continued from p. 778.)

Mr. Norman West, electrical engineer on the staff of the Supply Co., said that he first met Mr. Stobie when he got in touch with the Supply Co. with a view to that company financing him. That was in 1911, at which time he (Mr. Stobie) had a small works at Sheffield. He (witness) was directly connected with the construction of the Stobie Steel Works at Dunston, which were lent by the Supply Co. In 1915 he became secretary of the Stobie Steel Co., the business of which, at that time, was going very badly, and a supplemental agreement was entered into to get over the difficulty. A control committee of the Stobie Steel Co. was appointed, and witness was a member of that committee from that time until July 31st, 1917. He was at the Stobie Steel Works practically seven days a week, being in charge when Mr. Stobie was away. Mr. Stobie had no separate office in Newcastle, but used to work in a room in his private house. Between 1913 and the early part of 1917 he never heard that Mr. Stobie was carrying on any separate business in the nature of a construction business, and so far as he knew he had no building where he could do any construction. In 1917 the plant of the Bradley Williams works at Dunston was sold by auction. Witness attended the sale with Mr. Stobie and bought for the Stobie Steel Co. a store and 114 yards of main line sidings. That was bought for removal to the steel works. At that time there had been no suggestion of the purchase of the site of the Bradley Williams works. Shortly afterwards, however, Mr. Stobie reported to the committee that he had had an offer from the liquidators of the Bradley Williams Co. to sell the site for £2,000, and gave a glowing account of the possibilities if it were purchased. Mr. Sloan, the managing director of the Supply Co., and a member of the Stobie Control Committee, was against the proposal at first, but in the end he was won over by Mr. Stobie's glowing account of the possibilities. In the end the committee asked Mr. Stobie to prepare an estimate of the cost of equipping the new works with plant and machinery. The object of that was to see to what extent the Stobie Steel Co. would be committed if the project was

gone on with. Already they had made pig iron in the electrical furnaces at the Stobie Steel Works. Mr. Stobie's idea in acquiring the Bradley Williams works was to manufacture synthetic "pig," and he gave a glowing account of the profits which could be made out of synthetic pig iron, and said he had entered into negotiations with a Sheffield firm, Messrs. Dunford & Elliott, Ltd., to purchase all their output of synthetic pig. He also said that the machinery used for the manufacture of synthetic pig could afterwards be adapted to steel production, and that it would revolutionise the manufacture of steel by the electric smelting process. Upon that the committee sanctioned the project.

Although the hearing had stood adjourned until Wednesday, June 16th, Mr. Tomlin, K.C., mentioned the case on June 15th in the form of an application for postponement. He said that both sides had received telegrams from their respective clients suggesting the desirability of an adjournment with a view to a settlement, and he asked that the case might be allowed to stand out of the list while negotiations were taking place.

His Lordship agreed to this, and the further hearing was ultimately adjourned for three weeks.

Compensation Claim.

At Sunderland County Court, on June 17th, Robert Lawson Black, of Southwick-on-Wear, claimed compensation from Messrs. William Gray & Co., Ltd., of the Wear Shipbuilding Yard, for the death of his son, Robert Allan Black.

Defendants were not legally represented, but wrote offering a payment of £75 in settlement of the claim.

Mr. Malone, barrister, on behalf of the appellant, stated that on December 16th last the deceased youth was repairing an electric wire at the Wear shipyard when the current was inadvertently switched on by some person unknown, and he was instantaneously killed. Although only 16 years of age, deceased was over six feet in height, and doing journeyman's work. He took a keen interest in his profession, and was attending technical classes with a view to improving his prospects. Under those circumstances he asked his Honour to fix the amount of compensation at £150.

Judge Moore complied and allowed costs on C scale.

At a later stage of the day Mr. Thos. Richardson, barrister, entered the Court and informed the judge that he had been instructed to appear for the defendant company, but owing to the unsatisfactory train service the solicitor concerned and himself did not arrive in the town until the case was over. He therefore asked for a re-hearing on the ground that his clients considered the sum paid into Court was adequate.

Plaintiff's solicitor said Mr. Malone had then gone, but he (the solicitor) would raise no objection to the case being reopened.

His Honour said he would grant a rehearing at the next sitting of the Court, but on the facts as placed before him, he did not think there was much chance of his decision being altered.

In view of this expression from the judge, Mr. Richardson said his clients would again consider the matter.

Cuddon *v.* Robinson.

A novel and interesting point of law, arising out of the special war legislation, involving the question as to whether electrical installation for lighting purposes could be regarded as coming within the term "decorations" was raised in an action before Sir Francis Newbolt, High Courts Official Referee, which terminated on June 15th, after a hearing which occupied five days. The plaintiffs, Messrs. John Cuddon and Co., builders, of West Norwood, claimed from Mr. Henry Taylor Robinson, of Rosendale Road, Dulwich, the sum of £89, balance of account of £609 for work done and materials supplied, and the defence set up was that the contract being one for over £500 the work required the sanction of the Minister of Munitions, and such sanction not having been obtained, the money was irrecoverable. The plaintiffs' case in answer to this plea was that the work was done under orders given from time to time, and that even if the work could be regarded as coming within the terms of the order, after deducting the expense of putting in the electric light (£123) the cost would be brought down to a figure considerably below the £500.

Mr. Henriques, representing the plaintiff, argued that electric lighting was not decoration, and therefore did not come within the regulation laid down by the order of July, 1916, which made it lawful for the Minister of Munitions to authorise or prohibit the carrying on of building work. But the regulation was in relation to construction work or demolition, and the question was whether the work in question could be called either the one or the other. The electric lighting was carried out by Mr. Seagrove, electrical engineer, of Dulwich, whose charges included the supply of Osram lamps, brackets, and fittings, and defendant said that when an estimate of the probable cost of the work was given to him he understood it was to include the electric light installation.

The evidence related chiefly to matters of detail, after hearing which, judgment was reserved.

The Official Referee, in giving judgment on June 18th, decided that the defence of illegality had not been made out. It was, he said, abundantly clear that when the contract was made it was thought by both parties to be a smaller job than it turned out to be, although, even now, including the cost of electric lighting, it scarcely exceeded the limit of £500 named in the order of the Ministry of Munitions. The work was certainly not illegal *ab initio*, and the defendants contended that it became illegal when items were ordered bringing the cost over the limit at which time the parties ought to have known that a licence would be required, but he was not convinced that the electrical installation which amounted to £123 16s. 3d. was included in the words "construction, alteration, repairs, decoration, or the demolition of buildings," and it was clear to his mind that in this particular case the total cost of the whole completed work in contemplation relating to repairs and decorations never exceeded £500. That defence, therefore, failed. It was common ground that until the work was finished and the final account prepared neither party knew that a licence was necessary. In deciding, upon an analysis of the evidence, that plaintiffs were duly entitled to the reduced amount of £21 5s. 3d. on the claim, Sir Francis said that although the defendant had succeeded in reducing the claim, the expenses had been increased by the defence of illegality, and he therefore, in giving judgment for the plaintiffs for £21 5s. 3d., ordered the defendants to pay to plaintiffs half of the taxed costs on the High Court scale.

Hughes *v.* British Engine, Boiler & Electrical Insurance Co., Ltd.

Mr. Justice P. O. Lawrence, in the Chancery Division, on June 17th, heard an action in which Edwin Hughes, an insurance broker, of Swansea, sued the defendant company, of Manchester, for payment of commission on all policies of insurance effected with the defendant company through his introduction, and for an allowance for expenses and services rendered in connection with a scheme of "Engine Time Lost" insurance which was dropped.

Mr. R. A. Willes, for the plaintiff, said he acted as the defendant company's whole-time agent in South Wales for ten years, viz., from 1908 to 1918, and the connection came to an end as a result of a dispute concerning the payment of expenses. The terms upon which he worked were 15 per cent. on all boiler, engine, and electrical plant insurances. There was no agreement about expenses, but the defendant company told him that if they found that he had incurred travelling expenses on their behalf, they would act in a businesslike and reasonable way.

Mr. Beebee, for the defendant company, said they disputed the rate of commission. While it was 15 per cent. on boiler and electrical plant policies, it was only 10 per cent. on engines.

Mr. Willes went on to say that the "Engine Time Lost" scheme was for insurance in case of engine breakdowns, but although the plaintiff made considerable preparations for working the scheme and obtained favourable terms for underwriting the policies at Lloyd's, the defendant company were compelled to drop it, as they were bound by an arrangement with their own London underwriters to do the business through them. The plaintiff claimed something on account of the time and trouble he had been put to in connection with the matter.

Following an intimation from the judge, the parties agreed to an account being taken of the commission to be paid.

With regard to the claim for expenses and services rendered, Mr. Beebee submitted that there was no contract between the plaintiff and the defendant company.

His Lordship said he should allow him something for his trouble.

Mr. Beebee then said the defendants were prepared to make him an entirely *ex gratia* payment of £10.

His Lordship said that this would meet the case, and the plaintiff accepting, he made an order for this payment in full discharge of all claims under this head, and reserved the further consideration of other questions, including that of costs, until after the account had been taken.

Unfenced Machinery.

At the Hang East Petty Sessions the Masham & District Electric Supply Co., Ltd., were summoned for failing to have the projecting end of the main horizontal shaft at the Masham Electric Power Station securely fenced on April 15th. Mr. S. R. Bennett, H.M. Inspector of Factories and Workshops, prosecuted.

Mr. Bennett stated that on April 15th a fatal accident occurred at the power station, and it was arising out of that that the case had been brought before the court. The shaft was 3½ in. in diameter, and was the main driving shaft of the dynamo. It was situated horizontally about 3 ft. above the floor and the end of it projected 8 in. from the bearing, quite close to the passage, which was used for entering and leaving the station. On the date mentioned a youth, Frank Atkinson, aged 19, who was not an employé, visited the place for the purpose of seeing someone. His coat was caught

in the shaft, which was a revolving one, and he received injuries to which he later succumbed.

Evidence showed that the youth who was killed was wearing a mackintosh which was wet owing to a heavy shower of rain.

Mr. HEDDON, for the defendants, admitted the facts, and said the death of the youth was a most lamentable affair. The shaft was a perfectly smooth one, and it appeared that the mackintosh had stuck to it. There had now been a proper fence placed round.

The CHAIRMAN said the magistrates thought that the inspector did quite right in bringing the case, but they felt that no useful purpose could be served by inflicting a fine, as it was the publicity which was needed. They thought justice would be met by the payment of costs by the company.—*Yorkshire Herald.*

FAWCETT v. LINDSELL.

AT Devon Assizes, at Exeter, before Mr. Justice Bray, this action was down for hearing. Plaintiff, an electrical engineer, of Plymouth, claimed from defendant, Mr. W. J. Lindsell, of New Street, Paignton, £147 for work and material supplied in connection with an engine for a kinema theatre. There was a counter-claim, the defendant alleging that the engine was defective.

Mr. ROBERTS, for the defendant, informed his lordship that Mr. Lindsell had agreed to judgment for the full amount claimed and the dismissal of the counter-claim with costs on the plaintiff undertaking to repair the defect in the engine to the satisfaction of some engineer to be mutually agreed on.

Judgment was entered accordingly.

CHARGE OF STEALING LAMPS.

AT the West London Police Court, on Saturday, before Mr. Boyd, Jack West, 17, electrical engineer, 213, Hampton Road, Twickenham, was charged with stealing, by means of a trick, 30 electric lamps, valued at 15 guineas, belonging to Messrs. W. C. Tackley & Co., electrical engineers, 93, Hammersmith Road, W.; also 24 electric lamps belonging to the Delta Electrical Co., 584, High Road, Chiswick, and 36 electric lamps belonging to Ernest Chamberlen, electrical engineer, 196, King Street, Hammersmith.

Mr. D'ARCY HAMILTON, manager to Messrs. Tackley, said that on May 28th the accused entered the shop, and, representing himself as an agent of the City, Hall & Ellerman Shipping Co., ordered 30 half-watt lamps. He requested that a messenger should accompany him to the docks with the lamps, and said that payment would be made at the company's office. Witness dispatched a messenger with the lamps, but the lad afterwards returned without the money, and witness informed the police.

Evidence having been given, Det.-Sergt. Parsons told the magistrates that the accused had confessed to 17 cases, and had promised to assist the police to recover the property.

A remand was ordered.

THE DESIGN OF A SUPER-POWER STATION.*

By H. GOODWIN, Junr., and A. R. SMITH, of the General Electric Co., U.S.A.

(*Continued from page 797.*)

The first consideration in the electrical design is the determination of the fundamental connections between the generators, buses and feeders.

In this particular case one of the specified conditions was distribution by means of 66,000-volt underground single-conductor cables. It was decided that the concentration of energy in a short circuit on these cables should be limited to 500,000 K.V.A. on account of the possible resulting damage to adjacent cables. Comparing this with the rupturing capacity of available 66,000-volt oil switches showed that a switch having a rupturing capacity of 583,000 K.V.A. would best suit the service. It should be noted that the capacity of a generator is practically equal to the capacity of a transformer bank, and that one feeder working at full capacity would distribute the entire load of a generator and transformer bank.

Preliminary calculations proved the necessity of sectionalising the station bus by reactors in order to approach the 500,000-K.V.A. limit which had been set. Both low-tension and high-tension buses were considered, but the use of a low-tension bus was not only found unnecessary, but made the problem much more difficult. The reactance of the transformers added directly to the generators before either were connected to the bus would assist in reducing the short-circuit intensities very considerably.

The transformers in any case would have a reactance of 8 per cent. The generators would have a minimum reactance of 12.3 per cent., and under certain conditions this might be increased to 28.5 per cent. Therefore, the calculations were carried through for various values of generator reactance.

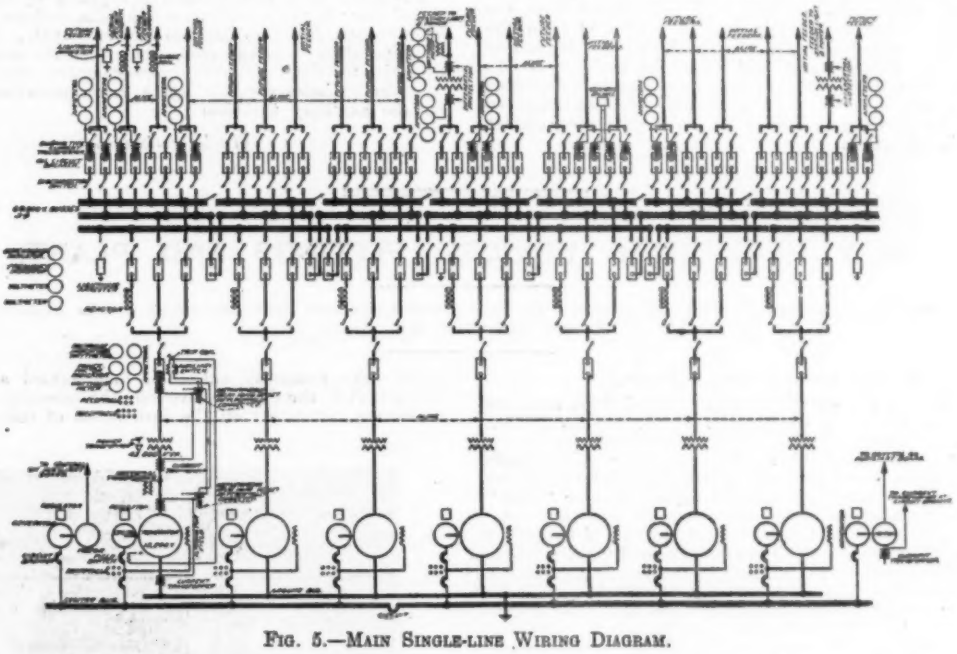


FIG. 5.—MAIN SINGLE-LINE WIRING DIAGRAM.

The minimum size of reactor which could be used with generator reactance of 15 per cent. in order to limit the short circuit intensity to approximately 500,000 K.V.A. was 9 per cent. A synchronising bus is necessary in order to limit the reactors to a reasonable size. The reactors should be rated to carry the total output of a generator.

It was desired to keep a unit arrangement right through the station, and this meant that the switchgear for each generator and its group of feeders should not occupy more length than would be required for the corresponding mechanical equipment of generator and boilers. Fortunately these

* From the *General Electric Review*, May, 1920. Abstract.

all work together very well and allow enough space on each generator stub-bus for the feeders required.

Fig. 5 shows the final solution. The neutral point of each generator will be earthed directly and positively. Since there is no low-tension bus, earthing of all generators cannot cause circulating harmonic currents between the generators. The main leads of each generator are connected directly to the corresponding transformer bank and through a main oil switch to a stub-bus.

The transformer connection is delta on the low-tension side and Y grounded on the high-tension side. It is particularly necessary that the earth resistance be made very low so that in case of short circuit on one of the single-conductor cables the neutral may not be distorted, thus placing an increased voltage stress on all the cables of the other phases.

From each generator stub-bus three connections are made; one through the reactor to the synchronising bus and the other two to double feeder stub-buses. The three selector switches connecting to the buses are non-automatic. The main switch is arranged for automatic opening in case of internal failure in the generator or transformer. This is accomplished by the use of relays differentially connected around the generator and around the transformer bank. Oil switches are shown for breaking the synchronising bus at two points, so that a section may be readily cleared for cleaning, extension, or repairs. The stub-buses are also arranged to be connected together so that at times of light load a small number of generators may carry the load of the whole station without feeding through the reactors. Referring to fig. 5, connection between the stub-buses in the lower line is provided for by oil switches, and in the upper line by horn-pipe air-break switches. The oil switches would be operated from the main bench board and the air break switches locally by hand through permanent levers.

Each feeder is equipped with two oil switches to select either of the two stub-buses. Each would be equipped with induction-type overload or other suitable type of relay, depending on the detail connection and interconnection of the distribution system.

It is thus seen that a very complete and flexible arrangement is provided. Normally, the generators are operated in parallel through the reactors and synchronising bus, but it is possible by proper interconnection of the feeder stub-buses to transfer loads from one generator to another in almost any manner desired.

Each generator will have a direct-connected exciter controlled by an automatic regulator. With this method no main field rheostat is necessary. The exciter will be provided with a field rheostat. For emergency excitation two motor-generator sets are proposed, supplying a sectionalised bus. These spare exciters will also be provided with automatic regulators. The motors driving the exciters will be supplied from the main station power board, but will be controlled from the main auxiliary board opposite the bench board. Indicating lamps on the power board will show the position of the switches so that there may be no danger of the operator of the station power board pulling disconnecting switches or otherwise interrupting service to a motor-generator exciter set while in operation.

As previously outlined, it was determined that turbines for auxiliary power would be necessary and that these should be connected with the main buses through a central auxiliary switchboard and transformers. A detailed study showed that one auxiliary turbine could best be used in connection with two main turbines, and that these auxiliary units should be rated at 2,500 KW., 0.7 p-f., 3,570 K.V.A.

For the control of the auxiliary turbines and the supply of essential auxiliary power it was found necessary to provide a switchboard near each auxiliary turbine, and for the general auxiliary power a central switchboard located on the switchboard gallery with tie cables to the four auxiliary units.

Fig. 5 shows two banks of station power transformers. It it proposed that each bank be composed of three single-phase 1,250-K.V.A. units, making a bank capacity of 3,750 K.V.A. connected delta-delta. These transformers would be located out of doors. The high-tension switches would be controlled from the main bench board and the low-tension switches from the auxiliary power board.

The reactance of the auxiliary transformers must be considered in connection with the reactance of the main units in order to limit the concentration of energy on the station power bus to a value which can be handled by reasonably small switches. Reactors are required in each of the four feeders connecting to the turbine auxiliary switchboards to limit the short-circuit intensity and permit the use of small rupturing capacity switches. It is proposed that these tie feeders to the turbine auxiliary boards be protected by differential relays connected to current transformers at each end of each line. In case of trouble on a cable it will be automatically disconnected and will allow the auxiliary turbine to continue supplying the essential auxiliaries without interruption. Reverse energy protection at the turbine auxiliary boards is also provided so that in case of a severe drop in voltage or frequency on the main system, the auxiliary turbines will be automatically disconnected and allowed to run independently, carrying the essential auxiliaries.

The central auxiliary board would be a vertical one with mimic buses and electrically-operated remote-control oil switches.

For station lighting three 75-KW. single-phase transformers controlled independently would form the supply. It is proposed that all lighting feeders be 3-wire, 115/230 volts, and be arranged in three groups which will normally operate on different transformers, but which in case of failure of a transformer can be manually thrown to one of the other transformers. By a connection from the 125-volt D.C. board, which will control the storage battery for circuit-breaker control, in case of failure of service on the A.C. lighting system certain emergency lights will be automatically connected to the battery.

The low-voltage power board is supplied by two 150-K.V.A. transformer banks operating at 240 volts, 3-phase. This board is arranged for miscellaneous power supply, such as the machine shop, turbine room cranes, house supply pumps, &c., also for the supply of motor-generator sets for charging the storage battery and a spare motor-generator exciter set for the auxiliary turbines.

(To be concluded.)

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A New Car Lighting Dynamo.

A new dynamo for the lighting systems of light cars has recently been developed by MESSRS. H. F. FOSTER & Co., LTD., Ashley Works, Epsom, and is illustrated in fig. 1. The output regulation of this small dynamo at varying speeds is achieved by a novel method, namely, by slightly shifting the brush rocker so as to give the brushes a greater "lead" as the speed increases. This movement is imparted automatically by means of either a control arm or, if desired, a Bowden wire, one end of which is attached to the brush rocker and the other either to the accelerator pedal or to the throttle lever of the carburettor, so that as the throttle is opened the lead of the brushes is automatically increased. The advantages claimed for this method are, first, a very close and accurate regulation of output at widely differing speeds; secondly, the ability to fix the point in the output curve at which it is desired to commence the regulation at any figure desired, either for fast or slow traffic; and thirdly, the fact that until this predetermined point is reached the output is not interfered with in any way, the dynamo generating up to such point as a simple shunt wound machine. The dynamo is so designed as to ensure sparkless commutation at all positions of the brush rocker. The M-type model for light cars is extremely compact, the dimensions of the magnet frame being only some 4 in. by 4 in. by 5 in., and generates its full rated output of 50 watts at 6 volts at the exceedingly low speed, for such a small machine, of approximately 1,500 R.P.M. The automatic cut-out is incorporated as a self-contained unit in the dynamo, avoiding the necessity of mounting a separate instrument on the dash board of the motor car.

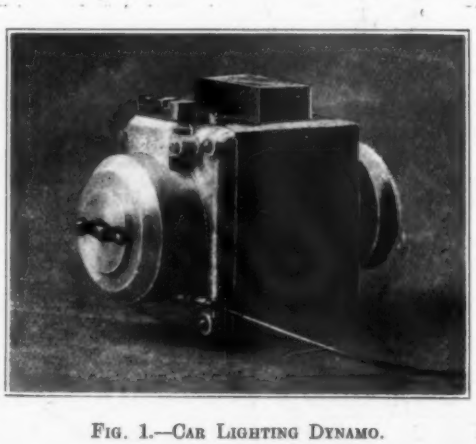


FIG. 1.—CAR LIGHTING DYNAMO.

A B.T.H. Pedestal Switch.

A recently published catalogue of oil-break switchgear by the British Thomson-Houston Co., Ltd., of Rugby, includes the pedestal switch illustrated in fig. 2. This is composed of an oil-break switch (300 amps. at 660 volts), time lags, ammeter, voltmeter (up to 660 volts), and a low voltage release.

"Welco" Fixing Frames.

In view of the constantly increasing cost of labour, any device which effects a saving in that quarter is sure of a welcome. All operations that can be performed in the factory should be done there, and as little as possible should be left to do on site.

Fig. 2.—A B.T.H. Pedestal Switch.

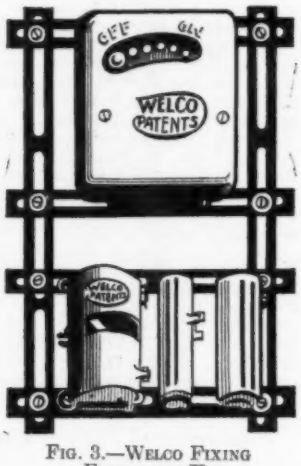


Fig. 3.—Welco Fixing Frames in Use.

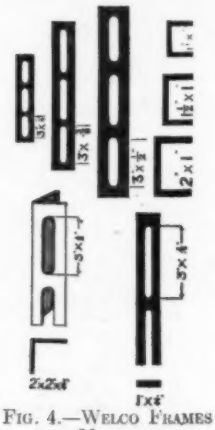


Fig. 4.—Welco Frames and Materials.

These principles are embodied in the "fixing frames" brought out by Messrs. Welco Patents, of 150, Alma Street, Birmingham. The frames consist of slotted channel bars, which are fixed direct to the wall; across these any number of slotted channel bars can be mounted with the greatest ease, forming a framework of any shape or size to carry switchgear, motor starters, meters, &c. Drilling, tapping, forging, and fitting are completely dispensed with. The bars are made in standard sizes, and in addition, mild steel channel, flat, and angle bars are stocked, all ready slotted for mounting on the frames, so that practically all requirements can be met. The simplicity and adaptability of this device are obvious, and it is certain to be found extremely useful in a great variety of applications. Fig. 3 shows a meter and switch mounted on the frame, and fig. 4 shows some of the patterns of bars and materials that have been standardised.

The fixing frames are provided with lugs giving a clearance between the frame and the wall of 1½ in. The slotted bars are made up to 8 ft. long, and the slots can be adjusted to meet any screw or bolt holes in the apparatus to be fixed thereon; should it be necessary to fix new apparatus on the frame, it can be readjusted to suit the new spacing of the holes with facility.

Lugs for Clamping Bands.

In many cases a flexible band is necessary wherewith to constrain to a certain diameter a number of pieces to complete a whole circle. These pieces must be securely held while certain operations of boring, turning, or facing, or all of these, are being performed. The usual way is to rivet L-shaped lugs on a steel band, but this is useless for holding the segments under the lugs, as the band pulls away from the segments and these become loose. In fig. 5 a band is shown, devised by Mr. J. T. Towlson, of Silvertown, which removes this objection. The fore feet protect the lugs from bending, and so long as the lugs do

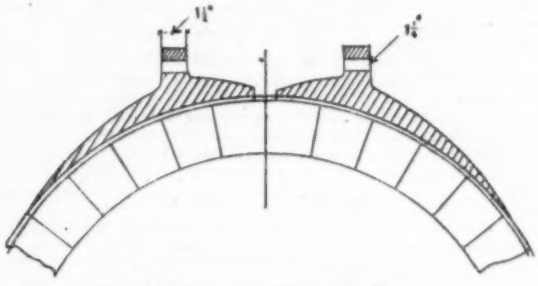


Fig. 5.—Lugs for Clamping Bands.

not bend the whole of the segments are securely held. The lugs may be riveted, but the up-to-date method is to weld them on.

An Electric Soldering Iron.

An electric soldering iron, designed by Mr. W. H. Browning and manufactured at the Imperial Electrical Works, 7-12, Imperial Mews, St. Martin's Avenue, East Ham, E.6, is illustrated in fig. 6. This is a very compact device weighing only 2¼ lb. and measuring 16½ in. in length. The main

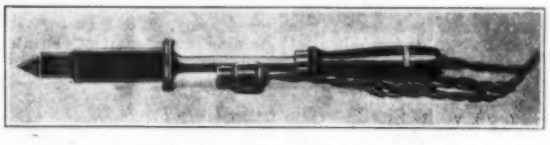


Fig. 6.—Electric Soldering Iron.

feature of this iron is that no screws are used in the construction of the heating portion, and scaling, with consequent loss of heat, is eliminated. Every part is easily renewable, and a six months' guarantee of reliability is given. The element is wound for any standard voltage, and the total loading is 300 watts.

The Decimal Association.—The report of the Association for 1919-20 gives a complete record of activities in many directions. A list of bodies to whom lectures on the subjects of decimal coinage and the metric system have been given is included, as well as the names of Chambers of Commerce and other associations and councils which have passed resolutions in favour of the adoption of the schemes for which the Decimal Association stands. In recording the Majority Report of the Royal Commission on Decimal Coinage, the Association makes it clear that the adverse result will only serve to stimulate its energies. The result of a *questionnaire* sent to over 15,000 firms, &c., resulted in an overwhelming majority in favour of the metric system. The financial statement for the year shows a deficit of £578, and it is hoped that special donations will be received from subscribers to ensure a better result for the present period.

Lighting the Albert Hall.—The Albert Hall, after preserving for so many years its Victorian atmosphere has at last linked itself with modernity through the installation of up-to-date lighting. The present lighting is provided by 16 1,000-watt Mazda half-watt type lamps in large Mazdalux metal reflectors. These units are fixed high up in the central dome, from which position they shed an intense illumination over the whole auditorium. The great height of the lamps eliminates any risk of glare, because it is impossible to see them without looking directly upwards. The improvement in the illumination, as compared with that given by the arc lamps, is extraordinary, and is due, not to any increase in the light generated, but rather to its more effective distribution, and the audience is able to read its programmes and papers with perfect ease.

In a place like the Albert Hall, where the lighting units are necessarily very difficult to get at, the question of maintenance is of extreme importance. Obviously, the new method of illumination is vastly superior to the arc lamps in this respect. The half-watt lamps need no attention whatever until the time arrives for replacement, and with the vitreous enamelled Mazdalux reflectors used the amount of cleaning required is reduced to the absolute minimum.

BUSINESS NOTES.

Openings for Salesmen.—MESSRS. FULLER'S UNITED ELECTRIC WORKS, LTD., wish to secure the services of a number of well-educated young men for their outdoor sales staff who have a live connection amongst garages and electrical engineers.

The King's Car.—MESSRS. VANDERVELL & CO., LTD., the manufacturers of the C.A.V. electrical products, have just completed the addition of their new coil ignition system to the lighting and starting installation already fitted to His Majesty's 57-H.P. Daimler. This company recently received the Royal Warrant, its equipment being fitted to the whole of the Royal fleet of automobiles.

Efficiency Exhibition.—We have received an advance prospectus of an "Efficiency Exhibition" which is being organised by the *Daily Mail* to be held at Olympia from February 10th to 26th, 1921. Special attention is being devoted to the place of science in industry, and the Electrical Development Association, the Federation of British Industries, the British Science Guild and similar bodies have offered their assistance to the scheme.

Annual Outings.—The staff of the GENERAL ELECTRIC CO., LTD., Glasgow branch, held their annual outing on Saturday, June 12th, at Tighnabruaich. A fine programme of sports was carried through in very fine weather. After tea Mr. P. J. Sims, manager, thanked the staff for the splendid support given him during the year just closed. Mr. A. G. Hawkins, assistant manager, also addressed the staff. Mrs. P. J. Sims presented the prizes.

The Designs Section of the Engineer-in-Chief's Office, G.P.O., held their fifth annual outing on Saturday, June 19th. The party of 24 visited Richmond, walked through the Park, Ham Common, and the tow-path to Kingston, where tea was provided. After a short stay at Kingston, the party divided and made for Hampton Court by tram and steam launch respectively. The Maze proved a severe test of the mechanical training and bump of location possessed by those entering it. The glorious weather helped to make the outing the most successful yet held.

Trade with Spain.—The *Board of Trade Journal* for June 17th contains some notes giving advice to firms anxious to establish connections in the Spanish market. Those who are not quite familiar with that market would be well advised to study the suggestions that are made, as the result of reports from British Consular officers and others, respecting signature of letters, language, addresses, and style of correspondence.

American Cable for Sweden.—According to a Stockholm newspaper, a contract has been concluded with an American firm for the supply of an underground cable, to be laid between Stockholm and Gothenburg. It will be from 250 to 300 km. long, and will cost about $3,200,000. The cable, it is said, will be the longest underground cable in Europe, and the third largest in the world.

Liverpool Electrical Strike.—The strike of the Liverpool cable-jointers and street-box examiners, Electrical Trades Union men, and 200 navvies employed in cable-laying for the Liverpool Corporation electrical supply department, has been in progress now over five weeks, and there seems no prospect of an immediate settlement being arrived at. The navvies' grievance is that they are not being paid the town rate of 2s. per hour, which is paid by the Master Builders' Association. The work of relaying and repairing the Corporation cables is, therefore, being held up.

Conduits for Canada.—United Kingdom firms who can quote for early delivery of standard sizes of conduits for electrical installations are invited to cable to H.M. Trade Commissioner at Toronto ("Toroncom, Toronto"), who has telegraphed to the D.O.T. in London on behalf of an inquirer in Ontario.

Hydro-Electric Strike in Canada.—The *Times* stated on June 19th that practically all the employés of the Ontario Hydro-Electric Power Commission engaged on the Chippewa power canal were striking for a 10 per cent. increase in wages, which would add about £450,000 to the cost of the work. Two days later our contemporary reported that owing to the strike, the Commission had decided to suspend work there, and 1,500 employés would be obliged to seek work elsewhere.

Copper and Lead Prices.—MESSRS. F. SMITH & CO., report June 22nd:—Electrolytic copper bars, £105, £5 decrease; electrolytic sheets, no change; electrolytic wire rods, £120, £5 decrease; electrolytic H.C. wire, 1s. 3¾d., ¼d. decrease; silicium bronze wire, 1s. 11½d., ½d. decrease.

MESSRS. JAMES & SHAKESPEARE report June 23rd:—Copper bars (best selected) sheets and rods, £158, £3 decrease; English pig-lead, £35 10s., 10s. increase, on last week's prices.

Lamp Manufacture in Belgium.—With the title La Société Belge pour la Fabrication de Lampes Electriques L.E.B., a new company has lately been formed in Brussels (4, Montagne du Parc), with a capital of 2,000,000 *fr.*, to manufacture electric lamps.

International Commerce.—Meetings are now in progress in Paris, attended by representatives of various British banking and commercial organisations, for the purpose of establishing an International Chamber of Commerce.

Catalogues and Lists.—THE GENERAL ELECTRIC CO., LTD., 67, Queen Victoria Street, E.C. 4.—Installation Leaflet No. P 2,327 (4 pp.). An illustrated description of the electrification of a large Scotch hosiery mill.

THE VAUGHAN CRANE CO., LTD., Openshaw, Manchester.—Booklet No. 7 (39 pp.). A well-produced, photographically-illustrated booklet describing the "Vaughan" electric block and its application to various types of cranes.

THE ANGLO-MEXICAN PETROLEUM CO., LTD., 16, Finsbury Circus, E.C. 2.—"The Story of Mexican Petroleum" (35 pp.). A photographic record of the work of the company, reproducing from pictures on exhibition at the Crystal Palace some excellent views of Mexican oilfields, &c.

MESSRS. MANN, EGERTON & CO., LTD., Norwich.—Booklet, "The Sign of Service," giving a *résumé* of the firm's various departments and their activities and addresses.

MESSRS. HIGGS BROS., Dynamo Works, Sand Pits and Summer Hill Street, Birmingham.—Latest abridged list of A.C. and D.C. motors. Priced and illustrated.

MESSRS. CHARLES CHURCHILL & CO., LTD., 9-15, Leonard Street, Finsbury, E.C. 2.—Pamphlet illustrating "Fluxio" high-speed tipped cutting tools of various types.

MESSRS. R. B. HAND & CO., LTD., 63, High Holborn, W.C. 1.—Up-to-date price-list of electrical fittings, including most wiring necessaries, conduits, cables, switches, &c.

MESSRS. WATSON & SONS (ELECTRO-MEDICAL), LTD., Sunic House, Parker Street, W.C. 2.—Leaflet (265) dealing with clocks for timing X-ray exposures and the Smart-Bristow medical coil. Illustrated and priced.

BRITISH INSULATED AND HELSBY CABLES, LTD., Prescot, Lancs.—Two illustrated leaflets, No. H 89, dealing with Leclanché batteries; and P 161, describing "Prescot" jointing materials and accessories, including compounds, tapes, and connectors. The latter is fully priced.

Dissolutions of Partnerships.—WHEELER & ISON, electrical and mechanical engineers, Homeleigh, Whippendell Road, and 190, Harwoods Road, Watford.—Messrs. G. Wheeler and W. Ison have dissolved partnership.

WOOD & HAGUE, ignition and lighting specialists, 1A, Saunders Street, Southport. Messrs. T. & J. Hague and S. Wood have dissolved partnership. The Messrs. Hague will attend to debts and continue the business.

Trade Announcements.—Mr. W. Johnston, for over 30 years with Messrs. Wm. Dow & Sons, Ltd., has, with his son, commenced business as electricians at 20, St. Andrew Street, Kilmarnock, under the style of WILLIAM JOHNSTON & SON.

Mr. R. Millett has been recently appointed by the ELECTRIC CONSTRUCTION CO., LTD., Wolverhampton, as their sole Lancashire and Yorkshire agent. Offices, 30, Cross Street, Manchester. Tel. No.: 7772 City.

MESSRS. F. SHIPTON & CO., of 14, Great Queen Street, Kingsway, W.C. 2, announce that on June 28th their business will be transferred to larger premises at 52, Floral Street, Covent Garden, W.C. 2. Telephone No.: Gerrard 374.

Owing to expiration of lease, MR. E. GOLDSTON, electrical engineer, 28, Marefair, Northampton, has removed to temporary premises at 13, Horsemarket, Northampton.

THE B.E. CO. (OF LONDON AND BIRMINGHAM), LTD., is desirous of appointing agents for its Hendon drawn-wire lamps, not for its general supplies.

Company Liquidations.—THE KINETIC CO., LTD.—Winding up voluntarily. Liquidator, Mr. T. Rimington, 43, Gallowtree Gate, Leicester.

TELEPHONE MANUFACTURING CO., LTD.—Winding up voluntarily for reconstruction purposes. Liquidators, Mr. F. T. Jackson and Mr. C. W. Rooke.

SELSON ENGINEERING CO. (FRANCE), LTD.—Meeting of creditors is called for June 28th, at 85, Queen Victoria Street, E.C.

NORMAN, JOHNSON & CO., LTD.—Voluntary liquidation. Mr. J. K. Garioch, 16, King Street, E.C. 2, liquidator. Meeting of creditors, June 30th.

For Sale.—West Hartlepool Corporation Electricity Department has for disposal one 600-KW. Bellis-Parker D.C. generator set; also one 100-KW. Bellis-Crompton D.C. generator.

By direction of the Disposal Board, Ministry of Munitions, MR. H. BASKETT will sell by auction, on July 13th, 14th and 15th, at the Ordnance Stores, Abbey Field, Colchester, a quantity of electrical stores, including cable, telephone sets, switchboards, &c.

ASSETS AUCTIONS CO., LTD., will sell by auction, at 119-121, Newington Causeway, S.E., on June 30th, the stock of an electrical goods factor.

Wigan Corporation Electricity Department invites offers for one Willans high-speed compound engine and condenser, direct-coupled to Dick, Kerr 560-volt generator; also a quantity of spares. Full particulars are given in our advertisement pages to-day.

White City Motor Show.—There is to be a great motor show at the White City in November. The buildings there have now been vacated by the Government, and members of the Society of Motor Manufacturers and Traders are to fully co-operate in the display. A further series of exhibitions representative of the various trades and industries of the country will follow.

Lead.—In their report dated June 19th, Messrs. James Forster & Co. say:—

We estimated last week a current consumption of 145,000 tons per annum, which we considered less than the actual. We are informed by actual consumers that the consumption of sheets and pipe has averaged 5/6,000 tons per month since May last year. We are also informed that the consumption of the electrical trades is nearer 100,000 tons a year than our figure of 60,000 tons. Our total should therefore be increased to 180,000 tons, or 15,000 tons per month, against which we have in available imported lead 30,000 tons in the last seven months. This condition of things is certainly not reflected on the London Metal Market, where values have been knocked down daily by continued realisation of old "Bull" accounts, and on Wednesday reached the heavy fall of £3 per ton on the day. . . . Consumers, naturally, have been absent, and there has been little export demand.

Messrs. G. Cawson & Co. state:—

The liquidation of the June account in lead has continued; in fact this account has turned out to be much larger than anticipated. June lead sold down to £31 5s. At the decline consumers have come forward and bought considerable quantities. The lower prices no doubt have encouraged them to cover not only prompt but also some of their forward requirements. Quite a good business has been done in all positions. The market has now a healthier appearance. There has been a little more export enquiry. . . . We calculate roughly that the total quantity of Australian lead still to be shipped is about 30,000 tons. Part of this, however, may go to the States, so that if the strike is not soon settled we may perhaps see some scarcity of lead later in the year. Many things, however, may happen before this occurs. Meanwhile, the supply of lead is ample. . . . The outlook is now decidedly more encouraging, and the lower level of prices will no doubt bring fresh buyers.

Electrical Window Displays.—The contributor of a recent article entitled "What is the Contractor Doing?" mentioned among other matters the want of attractive window displays. The criticism appears to be justified, and it is to be hoped that at a time when the public interest can be easily drawn to electrical labour and coal saving and dirt-avoiding appliances, there will be a greater display of show-window originality and enterprise in all our big centres. Messrs. A. Emanuel & Sons, Ltd., of George Street, Manchester Square, W.1, who have written to us on this matter, hold that the criticism is particularly applicable to British manufacturers, while American firms in this country are alive to this important side of electrical selling. They have sent us the accompanying photograph of a window display of electrical cooking devices, which shows the co-operation that

Electrical Window Display.

is sometimes noticeable between the contractor and the American manufacturer. The contractor in this case was not very easily persuaded to agree to the window display, but we are assured that the results have been remarkable considering that this was his only shop, and that it was in a side thoroughfare. We would urge manufacturers and contractors to co-operate enthusiastically along such lines, for we believe that the effort would be well worth while.

Herr Deutsch on German Industrial Conditions.—According to the *Economic Review*, the *Excelsior* publishes a statement by Herr Deutsch, a director of the A.E.G., concerning the effect of a Franco-German economic rapprochement and present conditions in Germany. Such a rapprochement would, he averred, have excellent results, and France need not fear Germany's competition, as the latter was scarcely in a position to carry out the orders already in hand. The whole world was inundating Germany with orders far beyond her present capacity. The word "sale" had no longer any meaning; in future, it would only be possible to speak of "production." The eight-hour day was a calamity for the whole world. If normal conditions were ever to be restored the miners must work ten hours, and all other workers twelve hours a day. Production was everywhere hampered by the lack of labour. Germany would call upon her workers to strain every nerve, and they would obey without fail, if only wholesome and ample food could be assured; otherwise all efforts would be in vain. In reply to the question whether the Customs tariff would have to be altered if an agreement were reached, Herr Deutsch said that no change would be made at present, but the commercial treaties would have to be revised at a later date. With regard to Germany's foreign exchange, he declared that it would recover for a space, but would then, he believed, experience another heavy fall.—*Neue Freie Presse*, May 20th.

Notes on Trade with Japan.—The Commercial Counsellor to H.M. Embassy at Tokio (Mr. E. F. Crowe, C.M.G.), has recently made a tour among firms and works in this country. In the *Board of Trade Journal* he writes:—

"This is my third experience in visiting the industrial centres in this country, and on each occasion I have found that the interest displayed in foreign trade has grown. In the past, complaints have often been made about British manufacturers not adapting themselves to the needs of particular markets, but as far as my own experience goes I have been surprised at the wonderful adaptability of the British manufacturer and his keenness to seek trade abroad, and his anxiety to conform to foreign requirements. Many of the firms are, of course, booked far ahead, but they are prepared to allot part of their output to foreign buyers, and all of them appear to be anxious to avail themselves of the machinery which the Government have now placed at their disposal for the purpose of collecting information abroad. In the course of my tour I have met several associations of manufacturers and merchants, and it has been possible, with their assistance, to draw up forms of questionnaires giving the kind of information which is needed by firms in this country. It is hoped that by adopting this system a great mass of useful information will be collected and will be immediately available for those who require it."

He says that the subject which has come up for discussion most frequently has been that of trade marks. It is well-nigh impossible in England to talk about trade with the Far East without touching on this complicated subject, complicated for two reasons: (1) That in China there is as yet no trade mark law, and that the arrangements for the mutual protection of trade marks as between the various countries, have not yet been completed; and (2) that unfortunately as regards Japan there have been a very great number of piracies. Goods bearing imitations of British trade marks have found their way into many parts of the world, and the complaints received have been very numerous. Japan is a signatory of the International Convention for the Protection of Industrial Property, and due protection is given to firms who have registered their trade marks in Japan, but much of the trouble has arisen from the fact that there have been imitations of marks of those firms who have not actually done business in Japan, and have consequently not registered their marks there, while there have also been imitations which, though not exactly close copies, are near enough to deceive the ordinary purchaser who is not well acquainted with the English language.

"At the present moment interest in Japanese trade undoubtedly centres in the immediate crisis. At a time when nothing but cancellations of orders are in the air, it is practically impossible to place new business, but I feel convinced that the future is rosy, and that very shortly matters will be adjusted, and a great many orders will once more be placed in England for those types of British goods which have deservedly earned so high a reputation in Japan in the past."

There has been a good deal of misapprehension about wages in Japan. Many people in England still think that a Japanese workman gets about sixpence a day and a bowl of rice. It is difficult, after there has been much talk of cheap Japanese competition, to make people realise that the cost of living has advanced more in Japan since the war than in either England or the United States, and that the average Japanese workman expects to receive about 7s. a day.

There are a large number of minor questions affecting Japanese trade, but on the whole it may be said that the chief problems at the moment are, on the one side, trade marks and quality of export goods, and on the other delivery of cotton spinning machinery. For the moment there is to be added also the all-important question of the cancellation of contracts above referred to, but it is to be hoped that when the banks find themselves in a position to render the usual facilities these difficulties will be got over and trade will once more run in its normal channels. The storm will have cleared the air, conditions will be much healthier, and the ordinary business man will be able to continue his steady and profitable business unhampered by the wild alarums and excursions introduced by the irresponsible speculator whose innings has now been terminated.

Bankruptcy Proceedings.—C. J. F. Hayman, electrical engineer, lately carrying on business at 96, Woodhouse Road, Leytonstone, and 1, Goodmayes Road, Goodmayes.—The first meeting of creditors was held on June 15th at the London Bankruptcy Court, before Mr. D. Williams, Official Receiver, under this failure. The debtor filed his own petition on June 2nd. He has stated that in January, 1919, being without capital, he took an empty shop at 96, Woodhouse Road, and there commenced to trade in the name of Cuthbert Hayman, as an electrical engineer. At first he was successful, but owing to difficulty in obtaining copper wire, he was unable to carry out all his orders. He was further handicapped by

lack of capital, and in December last he was advised to convert the business into a company. A Mr. Wood, to whom he was introduced, told him that he had several friends willing to take up shares, and early in December Hayman, Wood and Co., Ltd., was registered with a nominal capital of £4,000, of which £825 was subscribed within a week. He (debtor) was appointed managing director at a salary of £500 per annum, but in all he only received about four weeks' salary. As vendor he was allotted 700 shares for the stock (valued at between £300 and £400) and the goodwill; the registered office was at 45, Cheapside, E.C., but the business was carried on from Leytonstone and Goodmayes. The trading at the latter place was a failure, and the company gradually declined through want of capital, with the result that the business was closed down, and he was now employed as a fitter. The company agreed to take over the whole of his liabilities with the assets, but was unable to carry out its obligations to pay the debts, and in March last one of the creditors obtained judgment and levied execution upon his furniture. Further pressure followed, to escape which the debtor filed his petition. He now owes between £200 and £300 and has no assets whatever. The case was left in the hands of the Official Receiver to be administered in bankruptcy.

I. J. Hodson and B. H. Newman (Hodson & Newman), electrical engineers, 85, Queen Street, Exeter.—Receiving order made June 17th on debtors' own petition. First meeting, July 1st; public examination, July 8th, both at Exeter.

George Frederick Kiverson, electrical engineer, Goulders Place, Attercliffe Common, Sheffield, late 38, Shrewsbury Road, Sheffield.—The following are creditors:—

General Electric Co.	£188
Siemens Bros., Ltd.	76
Siemens Bros. & Co., Ltd.	159
Edison Swan Electric Co., Ltd.	178
Metropolitan-Vickers Electrical Co., Ltd.	31
Western Engineering Co.	12

A Modern Installation. — The electric lighting and power installation at the Metropolitan Water Board's new offices has been carried out by Messrs. Strode & Co., Ltd., on their improved steel conduit system of wiring; they have also installed their special system of telephones, fire alarms, and electric bells. From the electric lighting mains sub-mains are carried to sub-distributing boards, from which circuits are run to the various lights, the whole of the cables and wires being in heavy gauge screwed enamelled steel conduit. Similar mains are also taken to the main power panel, from which sub-power mains are run to distributing boards for various motors. The lighting installation includes about 3,000 lights, and the power installation for the various motors totals about 200 h.p. Approximately 100,000 ft. of steel tube has been fitted for the lighting and power wiring, and about 40 miles of cable. For the electric bells and telephones about 20 miles of wire has been employed. A special system of telephone communication has been provided to 74 stations, in addition to the G.P.O. system for which Messrs. Strode have provided the necessary steel conduits. Forty fire alarms have been fitted at various points, and a special call system to ring up the various departments has been installed at 32 stations. Sixty "Magneta" clocks have been fitted throughout the building. The electric light fittings were manufactured to special designs of the architect.

Garden Settlements for Steel Workers.—A considerable number of houses, in every way superior to those to which most workers have hitherto been accustomed, is now being built by John Brown & Co., Ltd., for the steel workers employed at their new steel foundry at Scunthorpe, Lincolnshire. These houses are of the bungalow type, constructed of concrete slabs, and with a careful regard to interior domestic conveniences. Each house, moreover, is provided with its own allotment plot, or garden. An extension of the same idea is, in addition, being carried out by the company in conjunction with several other large firms in the Scunthorpe district; a considerable estate is being developed there on garden city lines. A large number of houses is being erected, mostly of brick, and all the resources of modern town-planning utilised to provide in this busy manufacturing centre a healthy and picturesque residential quarter equipped with ample open spaces, and amenities associated with country, rather than industrial life.

Insurance Against Unemployment.—In the course of discussion at the annual meeting of the National Alliance of Employers and Employed at Birmingham, it was strongly urged that the Alliance should take up this problem and produce a scheme satisfactory to both parties. As a result the following committee has been appointed:—On the trade union side,

Mr. Arthur Pugh, of the Iron and Steel Trades Confederation.
Miss Julia Varley, Women's Branch of the Workers' Union.
Mr. Harry Dubery, of the Federation of Post Office Supervising Trade Unions.

The employers' representatives are:—

Major D. C. McLagan, of the National Federation of Iron and Steel Manufacturers.
Mr. Charles Tennyson, of the Federation of British Industries.
Mr. Philip H. Lockhart, of Messrs. W. & A. Bates, Ltd.
Mr. T. E. Jackson, of the Incorporated Association of Retail Distributors.

This committee will meet at an early date to make investigations, set out a general questionnaire, and obtain evidence.

Employés' Investment Scheme. — Messrs. Rashleigh, Phipps & Co., Ltd., electrical engineers and contractors, of Oxford Street, W., have adopted an investment scheme giving an opportunity to their employés to take an interest in the business. Out of an issued capital of £23,000 in £1 shares, 2,000 are described as employés' shares. The profits are divisible as follows: First payment, 6 per cent. per annum on employés' shares; second payment, 6 per cent. per annum on the ordinary shares; third payment, division of the surplus among both classes of shareholders in proportion to the capital paid up. The employés' 6 per cent. has therefore first claim. If there were a bad year and the 6 per cent. could not be paid, the dividend would be cumulative, and have first claim in the following year if that were not also a bad year. In the event of liquidation the employés' payments for shares would be repaid in full after the satisfaction of the company's creditors. Shares may be bought either outright or in instalments. If an employé leaves he must sell his shares to the directors for re-issue to other employés; he can only hold them at the directors' discretion. A pamphlet explaining the scheme has been issued, and no doubt the company would forward a copy to anybody interested.

Book Notices.—"The Decimal Educator." June, 1920. (31 pp.). London: The Decimal Association. Price 6d.—This little quarterly maintains its high standard, and the number before us is particularly interesting. The report of the Royal Commission on Decimal Coinage is ably criticised; we note that although 74 per cent. of the evidence from individuals or bodies outside official circles was favourable to decimal coinage, the majority reported against the very principle of decimalisation, a verdict which has never before been given by any inquiry, and which we venture to assert is contrary to the judgment of the great majority of the community.

"*Journal* of the British Science Guild, No. 11" (obtainable on application to the Secretary, 6, John Street, Adelphi, W.C. 2, price 1s. 1½d., including postage). Contains annual report of Guild for 1919-20; and memoranda on the Milk Question; State Awards for Scientific and Medical Discovery; Utilisation of Science in Public Departments; Army Hygiene in the War and After, &c.

"The How and Why of Radio Apparatus." By H. W. Secor. New York Experimenter Publishing Co., Ltd. Price $1.75.

"A Theory of Metallic Arc Welding." (11 pp.) By Ralph G. Hudson. Massachusetts Institute of Technology.—An illustrated reprint from the *Journal* of the American Welding Society, recording observations of the electric arc during welding operations, and deducing an explanation of the nature of the welded joint.

The "Bulletin" for 1918 of l'Association des Ingénieurs sortis de l'Ecole de Liége. (163 pp.).—Accounts of the six sections of the Association are given, and the commencement of a seventh at Hasselt is recorded. It is noticeable in the reports of meetings of the Association that purely technical discussions have been replaced by the study of the new economic conditions and problems attending the reconstruction of devastated Belgium.

"*Journal* of the American Institute of Electrical Engineers." Vol. XXXIX, No. 6. June, 1920. Annual Convention number. New York: The Institute. Price $1.

"Elements of Radiotelegraphy." By E. W. Stone. Pp. xii + 267; 125 figs. + 33 plates. London: Crosby Lockwood & Son. Price 16s. 6d. net.

"The Tramways and Light Railways Association *Journal*." Special Congress number. No. 210, June, 1920. London: The Association, Caxton House, S.W. Price 2s.

"Übersichtskarte der Elektrizitäts-unternehmungen und Gaswerke in den Nationalstaaten der ehemaligen österreichisch-ungarischen Monarchie," and "Übersichtskarte der Elektrischen Eigenanlagen in den ehemaligen österreichischen Ländern." Vienna: Verlag für Fachliteratur.—Two large maps compiled by Dr. Viktor Stöger, showing undertakings in Austria, Hungary, Czecho-Slovakia, Jugo-Slavia, Galicia, &c., indicating size and type of plant.

Strike.—Last week there was a strike of 300 employés of Messrs. Falk, Stadelmann & Co., Ltd., of Farringdon Road, London, on the question of wages and union membership.

Electricity Supply Rifle League. — We have received from Mr. E. Mathews, hon. sec., particulars of the matches of the league up to May, 1920, from an inspection of which it appears that very creditable results have been achieved. The Metropolitan Co's team that won the championship last year is unbeaten for the first half of the season, whilst Shoreditch has put up the best score—viz., 582—and Mr. Marriott, of Hackney, is the first to score a possible in this season's competition.

The Australian Trade Commissioner's Visit.—H.M. Senior Trade Commissioner in Australia (Mr. S. W. D. McGregor), who is now in this country, will commence a tour of certain areas on Tuesday, July 13th. He will begin in London, and firms who are desirous of meeting him should communicate with the Department of Overseas Trade, at 35, Old Queen Street, S.W. 1. Provincial firms should apply to the Secretary of their Chamber of Commerce.

Home Counties (No. 9) Electric Supply Industrial Council.—The schedule of consolidated rates has been got out by the Home Counties (No. 9 Area) Industrial Council, and approved by the National Council and circulated to the Member-Companies, the date from which the schedule becomes operative being May 1st.

LIGHTING AND POWER NOTES.

Ayr.—BULK SUPPLY.—The Corporation has been recommended by the Electricity Commissioners to negotiate for a bulk supply of electricity from the Kilmarnock Corporation.

Australia.—MELBOURNE STRIKE SETTLED.—The City Council ratified a proposal to grant the electricians an increase in wages of 3s. 6d. a day, and the strikers resumed work on June 18th. The whole trouble relating to the electricity supply is now ended, and lighting and power for the tramways will be made available.

Birmingham.—YEAR'S WORKING.—The total revenue for the past year's working of the electricity undertaking was £1,068,826, and expenditure £776,291, leaving a gross balance of £292,535. The payment of loan charges, &c., left a net surplus of £15,324. The total number of units sold was 127,938,924, at an average price of 2·005d. per unit.

Canada. — HYDRO-ELECTRIC DEVELOPMENTS. — The *Canadian Engineer* gives details of a new hydro-electric development, plans and specifications of which have been recently prepared by the Hydro-Electric Power Commission of Ontario. This project is to utilise the power afforded by the Ranney Falls, about one mile below Campbellford, Ontario. Two 5,000-H.P. turbines are to be installed, coupled to two three-phase, 60-cycle, 6,600-volt generators, each of 4,500 K.V.A. capacity. Under normal conditions a head of 47 ft. will be available. This will be the ninth installation in the Trent and Severn divisions.

Carlisle.—SUPPLY SCHEME.—A scheme for supplying a number of Cumberland villages, including Wigton, is under consideration.

Burnley.—EXTENSIONS.—In connection with the extensive scheme for the improvement of the undertaking, the Electricity Committee has now recommended the Council to place the contract for the work with the English Electric Co., Ltd., Preston, the total amount of the tender being £107,400.

Bury.—LINKING-UP.—In connection with the scheme for inter-supplies of electricity between the Corporation electricity department and the Lancashire Electric Power Co.'s works at Radcliffe, the Town Council proposes to apply for sanction to borrow £95,000 for the necessary extensions at the electricity works. After consultation with the company, the engineer has placed orders for the tranformers required. To meet present obligations, Heywood requires 1,870 H.P. and Radcliffe 1,440 H.P. in addition to their present supplies. Subject to the scheme being approved by the Electricity Commission, and the sanction of the Minister of Health being obtained to borrow the money, a contract is to be placed for the supply of an 8,000-10,000-KW. set.

No change is to be made in the charges for electricity by the Corporation until the end of the present quarter.

Chester-le-Street.—PROPOSED ELECTRICITY SUPPLY.—The Rural District Council has decided to obtain prices for the supply of electricity for comparison with prices of gas supply to the Council's housing scheme at Washington.

Chirk.—ELECTRIC LIGHTING.—At a special meeting of the Rural District Council, held to consider the lighting question, the chairman stated that, in view of the small population, he did not think that electric lighting would be remunerative, while another member urged that the gasworks should not be proceeded with until it was known what an electricity scheme would cost. Ultimately it was decided to ask Mr. G. Bremner Smith to advise the Council on the matter.

Co. Dublin.—ELECTRICITY SUPPLY.—The question of having a centralised electricity supply for the Co. Dublin coast townships was mentioned at the Blackrock Urban Council, when a letter was received from the Electricity Commission to the effect that the Commissioners were in communication with the Dublin Corporation, and were suggesting that a bulk supply should be given to Blackrock and Pembroke. It was hoped to deal with the matter as soon as the Corporation had gone into it. The Kingstown Urban Council appointed a Committee to consider a scheme for the lighting of the township by electricity, with a view to having a centralised source of supply for the other townships of the surrounding district, a conference is being convened to consider the proposal, to which representatives of Blackrock, Dalkey, Killiney, and Rathdown, are being invited.

Colwyn Bay.—YEAR'S WORKING.—The chairman of the Lighting Committee announces a profit of £217 for the year ended March 31st last.

Cullompton (Devon).—LIGHTING SCHEME.—The promoters of the electric light scheme have decided to go on with the project, a circular letter to householders to ascertain the probable number of consumers having proved highly satisfactory.

Dalkeith.—EXPERT ADVICE.—The Town Council has requested the Electric Supply Corporation to allow an independent engineer to examine and report on the plant in the works at Croft Street, in view of the unsatisfactory lighting provided in the town last winter.

Devonshire.—ELECTRICITY SUPPLY.—For the purposes of electricity supply, Devonshire has been divided into four sections, with centres at Plymouth, Exeter, Torquay, and Barnstaple. Since this partition was made, a map has been prepared, introducing a part of Somerset and part of Cornwall into the scheme. A Committee of the Devonshire County Council will meet the Electricity Commissioners on June 29th in London, to confer on the scheme.

Electricity Districts.—The Electricity Commissioners have provisionally determined that the undermentioned areas shall be constituted separate electricity districts for the purposes of the Electricity (Supply) Act, 1919 :—

WEST RIDING.—The cities and county boroughs of Bradford, Leeds and Wakefield ; the county boroughs of Barnsley, Dewsbury, Halifax and Huddersfield ; the municipal boroughs of Batley, Brighouse, Keighley, Morley, Ossett, Pontefract, Pudsey and Todmorden ; the urban districts of Altofts, Ardsley, Ardsley East and West, Baildon, Barkisland, Barnoldswick, Bingley, Birkenshaw, Birstall, Burley-in-Wharfedale, Calverley, Castleford, Clayton, Clayton West, Cudworth, Darfield, Darton, Denby and Cumberworth, Denholme, Dodworth, Drighlington, Earby, Elland, Emley, Farnley Tyas, Farsley, Featherstone, Flockton, Garforth, Gildersome, Golcar, Goole, Greetland, Guiseley, Gunthwaite and Ingbirchworth, Haworth, Hebden Bridge, Heckmondwike, Hipperholme, Holme, Holmfirth, Honley, Horbury, Horsforth, Hoylandswaine, Hunsworth, Ilkley, Kirkburton, Kirkheaton, Knottingley, Lepton, Linthwaite, Luddenden Foot, Marsden, Meltham, Methley, Midgley, Mirfield, Monk Bretton, Mytholmroyd, New Mill, Normanton, Oakworth, Otley, Oxenhope, Penistone, Queensbury, Rawdon, Rishworth, Rothwell, Royston, Scammonden, Selby, Shelf, Shelley, Shepley, Shipley, Silsden, Skelmanthorpe, Skipton, Slaithwaite, South Crosland, Southowram, Sowerby, Sowerby Bridge, Soyland, Spenborough, Stainland, Stanley, Thurlstone, Thurstonland, Whitley Upper, Whitwood, Wombwell, Worsborough and Yeadon ; the rural districts of Barnsley, Goole, Halifax, Hemsworth, Hunslet, Keighley, Penistone, Pontefract, Selby, Tadcaster, Todmorden, Wakefield, Wetherby and Wharfedale and the parishes or townships of Addingham, Bank Newton, Beamsley, Bolton Abbey, Bracewell, Bradleys Both, Brockden, Broughton, Carlton, Coates, Cold Coniston, Cononley, Cowling, Draughton, Elslack, Embsay-with-Eastby, Farnhill, Gargrave, Glusburn, Halton East, Hazlewood-with-Storiths, Kildwick, Lothersdale, Martons Both, Salterforth, Thorlby-with-Stirton and Thornton, in the rural district of Skipton.

SOUTH-EAST LANCS.—In the County of Lancaster : The City and County Borough of Manchester : The County Borough of Bolton, Bury, Oldham, Rochdale, Salford and Wigan : The Municipal Boroughs of Ashton-under-Lyne, Eccles, Heywood, Leigh, Middleton and Mossley : The Urban Districts of Abram, Ashton-in-Makerfield, Aspull, Atherton, Audenshaw, Billinge, Blackrod, Chadderton, Crompton, Denton, Droylesden, Failsworth, Farnworth, Golborne, Haydock, Hindley, Horwich, Hurst, Ince-in-Makerfield, Irlam, Kearsley, Lees, Littleborough, Little Hulton, Little Lever, Milnrow, Norden, Orrell, Prestwich, Radcliffe, Ramsbottom, Royton, Standish-with-Langtree, Stretford, Swinton and Pendlebury, Tottington, Turton, Tyldesley-with-Shakerley, Upholland, Urmston, Wardle, Westhoughton, Whitefield, Whitworth and Worsley : The Rural Districts of Barton-upon-Irwell, Bury, Leigh, Limehurst and Wigan ; and the Township of Rixton-with-Glazebrook in the Rural District of Warrington.

In the County of Chester : The County Borough of Stockport : The Municipal Boroughs of Dukinfield, Hyde and Stalybridge : The Urban Districts of Alderley Edge, Altrincham, Ashton-upon-Mersey, Bowdon, Bredbury and Romiley, Cheadle and Gatley, Hale, Handforth, Hazel Grove and Bramhall, Hollingworth, Knutsford, Lymm, Marple, Mottram-in-Longendale, Sale and Wilmslow : The Rural Districts of Bucklow and Tintwistle.

In the County of Derby : The Municipal Borough of Glossop : The Rural District of Glossop Dale.

In the West Riding of the County of York : The Urban Districts of Saddleworth and Springhead.

Objections or representations may be made on account of the inclusion of any area in, or the exclusion of any area from, the districts so provisionally determined, and all such objections or representations must be made in writing addressed to the Secretary, Electricity Commission, Gwydyr House, Whitehall, London, S.W. 1, stating the grounds upon which the objections or representations are made, and must reach the said offices of the Commissioners not later than October 31st, 1920.

It being apparent to the Electricity Commissioners that the existing organisation for the supply of electricity in the districts so provisionally determined should be improved, notice is further given that they intend to hold local inquiries into the matter, and any authorised undertakers, as defined in the Electricity (Supply) Act, 1919, any County Council, any local authority, any railway company using, or proposing to use, electricity for traction purposes, any large consumer of electricity, and any association or body directly concerned with the production or use of electrical energy within the districts, may, on or before the said 31st day of October, 1920, submit in writing schemes for effecting such improvement in organisation, including the formation of joint electricity authorities for the districts, and any proposals for altering or adjusting the boundaries of the districts so provisionally determined.

Notice will be given of the dates of the proposed inquiries.

Exeter.—YEAR'S WORKING.—The electrical engineer reports a surplus of £1,833 for the year ended March 31st, comparing favourably with a deficit of £1,735 for the previous year. This result is attributed partly to increased prices, and partly to the removal of lighting and power restrictions.

Derby.—PAYMENT OF "AWARD."—The failure of the Corporation to give effect to the £30 bonus award, as from Jan. 1st, led to the presentation of notice to withdraw by members of the staff. A special meeting was called, when it was decided to accede to the terms of the award by paying the bonus from the stipulated date.

Federated Malay States.—ELECTRICITY SUPPLY.—The *Board of Trade Journal* states that the Governor of the F.M.S. recently foreshadowed a scheme for the uniform supply of electricity to the States and Straits Settlements for power, drainage, and railways. An expert has been engaged to investigate and formulate a scheme.

Fleetwood.—LOAN.—Application is to be made to the Electricity Commissioners for sanction to borrow £5,000 for new mains and services, and £2,000 for the provision of meters for the Council's housing scheme.

PRICE REVISION.—The Urban District Council has decided to apply to the B.O.T. for an order under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, for such modifications of the Fleetwood Electric Lighting Order, 1908, as will enable the Council to charge a flat rate of 8·4d. per B.O.T. unit.

Hinderwell.—ELECTRIC LIGHTING SCHEME DEFERRED.—The Cleveland and Durham E.P. Co. has informed the Urban District Council that with reference to the electric lighting scheme it would be necessary for the Council to lay its own cables, as the town is outside the company's area. The cost would be at least £6,000, in addition to from £2,000 to £3,000 for a sub-station, and the cost of a prov. order. The Council has decided to defer the matter, and to await mining developments in the district.

Kingston-upon-Hull.—YEAR'S WORKING.—The statement of accounts for the year ended March 31st last records a total income of £218,136, as against £144,369 for the previous period. The expenditure increased by 32 per cent. to £166,724, leaving a gross surplus of £51,412. The deduction of income-tax, loan interest, &c., resulted in a net balance of £8,931, of which £7,987 was transferred to the reserve fund, the remainder cancelling a deficit of £944 from last year.

Leeds.—YEAR'S WORKING.—The total income of the electricity undertaking for the year ended March 31st, was £230,895, as against £141,767 for the previous year. Expenditure, including loan charges, income-tax, &c., amounted to £186,486 against £141,118, leaving a gross surplus of £44,409, comparing with a profit of £649 for 1918-19. The total number of units sold increased from 63,387,433 to 63,023,502, and the average price per unit from 1·26d. to 1·79d.

Littleborough.—HOUSING SCHEME.—The General Purpurposes Committee of the Urban District Council has instructed Mr. Hawtayne, electrical engineer, to prepare plans and estimates for cables and fittings for the supply of electricity to the houses which are to be erected by the Council at Calderbrook, as well as for the street lighting in connection with the scheme.

Liverpool.—STRIKE.—The Executive Committee of the Electrical Trades Union has ratified the action of the cable jointers and street-box men employed by the Liverpool Corporation, who are on strike for higher wages. The Mersey District Secretary of the Electrical Trades Union has resigned from the Joint Industrial Council for the Electricity Supply Industry, one of the reasons, we understand, being that the Council has not held a meeting during the several weeks this dispute has been in progress.

London.—ST. MARYLEBONE.—The statement of accounts of the electricity undertaking for the year ended March 31st, 1920, records a total revenue of £307,073, as against £245,156 for the previous year. The total expenditure was £174,007, as against £134,707, leaving a gross balance of £133,066, compared with £110,449. Interest charges, loan repayments, &c., amounted to £109,954, as against £111,452, and the net result was therefore a surplus of £23,112, which compared very favourably with last year's deficit of £1,003. A total of 19,770,781 units was sold at an average price of 1·798d. Last year's figures were 16,245,133 and 1·712d. respectively.

Loughborough.—YEAR'S WORKING.—After meeting all interest and sinking fund charges for the year ended March 31st last, the electricity undertaking showed a balance of £1,144—the highest since its inception. The average price per unit sold was 1·95d., and a total of 2,964,096 units was generated.

Manchester.—HOUSE LIGHTING.—The Gas and Electricity Committees are to prepare and submit a joint report as to the system of illumination most desirable for the Corporation's housing scheme.

Nottingham.—ELECTRICITY SCHEME.—An admirable site contiguous to the Trent, and at no great distance from Clifton Colliery, one of the largest undertakings in the immediate neighbourhood of the city, has been acquired for Nottingham's new electricity generating station, but considerable criticism has been already forthcoming locally as to the alleged undue haste with which the report of the responsible Committee dealing with the matter, was presented and adopted, involving as to the first section of the work an expenditure of over £800,000. Mr. A. R. Atkey, M.P., a member of the Corporation, and one of the City's Parliamentary representatives, questions whether the Council was wise in summarily ignoring the offer to supply electricity, which was made by the Notts. and Derbyshire Power Co., possessing statutory powers for the area outside the municipal boundary. He urges that this alternative plan should have received a larger measure of consideration before the Council arrived at its precipitate decision.

Price Increases.—In consequence of additional working expenses, the following towns have adopted increased scales of charges:—Ascot, Barnes, Basingstoke, Batley, Birmingham, Clacton-on-Sea, Darlington, Doncaster, Dublin, Dundee, Fleetwood, Gillingham, Glossop, Godalming, Heywood, High Wycombe, Meeksham, Paisley, Ramsgate, St. Annes, Southend-on-Sea, Taunton, Warrington, Whitehaven, Wolverhampton and Worksop.

Wallasey.—EXTENSIONS.—To meet immediate demands, Wallasey Corporation has decided to lay a high-tension main to New Brighton, with the necessary transformer and switchgear at a total cost of £2,728. The Corporation has taken into account the anticipated load for the next five years. A rebate of ¼d. per unit is to be allowed consumers from the June quarter bills, as defined by the Coal (Pit's Mouth) Prices Order, 1919, in respect of energy consumed for the whole period from December 1st, 1919, to May 12th, 1920.

Worksop. — EXTENSION OF SUPPLY. — Considerable extension of the existing system of electricity supply was decided upon at the last meeting of the Worksop Urban District Council, the estimated cost being over £50,000. The original lighting scheme entailed an expenditure of £37,000, of which £26,000 has been repaid. The Committee had had two schemes under consideration, one for taking energy from Manton Colliery and the other involving an extension of the Council's own plant, the Committee being favourable to the first-named plan. One of the items of £17,830 included in the estimate would only be spent, it was explained, when necessary, and extensions would not be undertaken unless there was guarantee of an adequate return.

Yeovil.—ELECTRIC LIGHTING ORDER.—Messrs. Petters, Ltd., have informed the Town Council that it is not their intention to carry out the Electric Lighting Order they obtained in 1914, and asked if the Council would consider taking on the rights. The Council has declined the offer.

TRAMWAY AND RAILWAY NOTES.

Ayr.—FARE INCREASE. — The raising of additional revenue from the tramways has been under the consideration of the Town Council. The deficit of £3,227 last year was taken from the reserve fund, reducing the latter to £1,772. The estimated deficiency for the year ended May 15th, 1921, is £5,617. It was decided to adopt certain recommendations of the Tramways Committee permitting increases in the fares, discontinuing privilege and permit tickets, and readjusting workmen's fares. By these means it is estimated an extra income of £4,867 will be obtained.

Belfast.—FARE REVISION.—The question of revision of fares and stages was on the agenda at a meeting of the Corporation Tramways Committee, last week, and was adjourned for further consideration. Mr. J. Johnstone, of the National Amalgamated Union of Labour, and Mr. John Malcolm, of the Municipal Employés Association, appeared before the Committee in support of an application for an advance of 1½d. per hour on the basic rates for motormen, conductors, and the depôt staffs. After some discussion the matter was adjourned pending a report from the general manager.

Bolton.—WAGES.—Following the action of the Corporation Tramways Committee in refusing the tramway men double pay for the four days of the Royal Lancashire Agricultural Show, the employés have asked the Committee to reconsider its decision, and to receive a deputation. The men are also applying for an alteration in the basic rates of pay.

Continental. — ITALY. — RAILWAY ELECTRIFICATION.—Steps are being taken by the Italian Ministry of Public Works for the electrification of the Ligurian and Piedmontese railways, including the Genoa-Turin-Modane line, the Union of Central and Northern Italian railways, the Rome to Naples and Sulmona and other Southern lines. Similar operations will be carried out on the Brenner Pass and the Florence to Bologna and Faience lines. It is estimated that altogether 1,400 km. of railway lines will be electrified at a cost of 800 million lire.—*Economic Review.*

Darlington.—EXTENSIONS DEFERRED.—Consideration of the proposal to lay a tramway track from Market Place to the Victoria Road entrance to Bank Top Station, at an estimated cost of £15,000, has been deferred.

Gateshead-on-Tyne.—TRAMWAY DEFICIENCIES.—At a meeting of the Town Council on June 16th, a letter was read from the Ministry of Transport with reference to complaints regarding the tramway services in Gateshead. The Director-General of Traffic wrote that on the information which had been obtained and which had been laid before him, the Minister of Transport was satisfied that the Gateshead and District Tramways Co. was honestly endeavouring to cope with post-war conditions, having, as was natural, due regard to the interests of the undertaking. There appeared to be no sovereign remedy for the conditions to be

immediately applied by either the company, the Corporation, or the Ministry of Transport. It was considered, however, that the action which the company had agreed to take was calculated to improve the situation as quickly as was practicable. The Minister suggested the following action by the Corporation, which he thought would contribute to this end :—

1. Co-operation with the tramway company in keeping the loading of cars within reasonable limits, and stopping the practice of travelling on platforms, steps and buffers.

2. Keeping the company advised of any specific requirements, and particularly definite cases of shortage of accommodation.

3. Further consideration, as an important means of relieving congestion under the circumstances, of the question of admitting to the borough, 'buses bringing passengers in from the surrounding d strict.

4. Consideration whether it was possible to take any steps to spread the "peak" load over a longer period.

5. If possible, removal of the cab rank from Wellington Street to one of the adjacent streets.

Huddersfield.—Car Building.—The Tramways Committee has decided that as soon as possible cars will be constructed by the Department.

Leeds.—Wages.—Leeds tramwaymen are to receive £2,000 in retrospective advances in wages from March 29th last. Motormen now receive £3 18s. for a week of 48 hours, compared with £1 18s. 6d. for a week of 60 hours before the war, and conductors get £3 14s., as against £1 13s. 6d.—*Financial Times.*

Accident.—One of the Corporation's trackless cars travelling from Guiseley to Otley, on June 14th, crashed into a wall on the roadside at Menston. The driver was badly shaken, and received cuts on the hand from the broken glass, but the 16 passengers escaped injury. The front of the car was wrecked. It is thought that something went wrong with the steering gear.

London.—L.C.C. Motor-'Bus Scheme.—Having been compelled to withdraw the clauses of the L.C.C. (Tramways and Improvements) Bill, providing for extensions to tramways, the L.C.C. has asked for powers to provide a subsidiary omnibus system at a cost of £400,000. The object is to link up the termini of the tramway system, and to serve new housing schemes, &c. Mr. Vesey Knox, K.C., on behalf of the County Council, said that the refusal of the local authorities to permit the laying of new lines in their districts had given the L.G.O. Co. an opportunity to raise its rates in these localities, thus enabling it to compete with the cheaper tramways in other parts. Mr. G. H. Hume, answering Mr. Freeman, K.C., who appeared for a number of London authorities, and Mr. Honoratus Lloyd, K.C., for the L.G.O. Co., denied that the idea of the scheme was to run in opposition to existing omnibus services, although he admitted that the Bill as drafted would enable the Council to do this. Mr. Hume also deprecated the suggestion that the Council wished to be authorised to run an omnibus service before the setting up of a traffic authority.

London.—Fare Increase.—Acting on the authority of the Ministry of Transport, the Metropolitan Electric Tramways raised the fares on their system on June 22nd. The new scale of charges is :—Two stages for 1½d. (minimum fare); three stages for 2d. ; five stages for 3d. ; and for each additional two stages, 1d. Some of the new fa es are :—Golders Green—Barnet, 6d., instead of 5d ; Finsbury Park—Waltham Cross, 10d., instead of 8d. ; Edgware Road—Sudbury, 8d., instead of 6d. Workmen's fares, single fare for return journey. The fares on the omnibuses serving the same districts will be revised on the same scale.

Stopping Places.—Several alterations in stopping places for tramcars and omnibuses at Greenwich, Batterseа, Herne Hill, &c., were made on June 16th, upon the recommendation of the Advisory Committee on London Traffic.

Preston.—Additional Plant.—The Tramways Committee has authorised the engineer to obtain tenders for the supply of additional plant at the power station, in view of the increase in the service.

Railless Cars.—Mr. A. H. Wilkinson, Bradford, in a paper at the annual meeting of the Municipal Tramways Association (managers' section), at Birmingham, last week, said he had been favourably impressed with the performances of railless electric vehicles, and could see a brighter future in store for them. Up to the present they had been considered as an auxiliary or adjunct to the main tramway service, but under existing conditions a considerable extension of railless electric transportation appeared very probable.—*Financier.*

West Riding.—Wages Award.—The award which has been made by the Joint Industrial Council to the tramway industry affects the towns in the West Riding area as follows :—Group 1 (3s. per week increase): Leeds, Sheffield, Bradford, Hull and Hudderafield ; Group 2 (2s. per week) : Halifax, Doncaster, York and Barnsley ; Group 3 (1s. per week) : Wakefield, York, Keighley, Rotherham, Mexboro' and Swinton, Dewsbury and Ossett. The award is retrospective from March 29th last, and is in addition to the award of 6s. per week made by the National Council.

Weston-super-Mare.—Time Extension.—The Electric Supply Co., Ltd., has applied to the Ministry of Transport for an extension of time until August 6th, 1922, for completing the tramways under the Order of 1900.

TELEGRAPH AND TELEPHONE NOTES.

Ecuador.—New Wireless Stations. — A wireless station has been erected at Quito by the Société Française Radio Electrique on account of the Government of Ecuador, and similar stations are also being erected at Guayaquil and Esmeraldas. These stations are of 10 kw.

A Presidential Decree was published in the "Registro Oficial" of March 13th, prohibiting all private parties from importing and establishing wireless apparatus in the Republic.—*Board of Trade Journal.*

Finland.—Telephone Extension.—The South Finland Inter-Urban Telephone Co. proposes to extend its network of lines over another 1,000 km., which will involve an expenditure of F.Mk.3 mill. With this end in view, the capital will be increased from F.Mk.5 to 7 mill.

French Colonies.—New Wireless Stations.—The *J. de Marine Marchande* (May 20th) gives an account of the wireless telegraphy stations in course of construction in the French Colonies.

In 1917 it was decided that the military colonial wireless system should include powerful stations at Saida, in Southern Algeria, Bamako, in French West Africa, Brazzaville, in French Equatorial Africa, Antananarivo, in Madagascar, and Saigon, in Cochin China. The construction of the four latter stations has reached the following stages :—

Bamako : The buildings are nearly finished ; a great deal of the material is already to hand or in place, and the electrical fittings will be forwarded in June.

Brazzaville : The buildings are started, the yards having been opened in December, 1919 ; the plans for the establishment of a hydro-electrical works are drawn up.

Antananarivo : A site for the station has been definitely fixed ; a contract for the supply of electrical energy has been drawn up ; the electrical fittings will arrive at the end of the year.

Saigon : The buildings are nearly finished ; the contract for the supply of electrical energy is signed ; the material will be delivered at the beginning of 1921.

These four large stations, planned for military purposes, will be transferred, when finished, to the Administration of the Postes, Télégraphes et Téléphones. Smaller stations, established by the colonies themselves, and intended for communication in West Africa between neighbouring colonies or between certain centres in the same colony, will be at Port-Etienne, Dakar and Rufisque in the Senegal, Monrovia in Liberia, Conakry in Guinea, Tabou on the Ivory Coast, Bamako—a small temporary station—and Kabara. —*Economic Review.*

Telephone Service.—Deficit.—The Postmaster-General announces that a deficit of £1,750,000 is expected as a result of working for 1919-20. This allows for the payment of interest on capital to the extent of £880,000.

Select Committee.—The Government has decided to ask the House of Commons to appoint a Select Committee to examine the present charges made to the public for the use of the telephone service and to report in what respect these charges require revision, in order to place the service on a remunerative basis. The proposal is that the Committee should consist of Sir Edward Coates, Sir Harry Brittain, Mr. Archdale, Sir Hamilton Benn, Mr. Briant, Mr. Tyson Wilson, Mr. John Robertson, Mr. Carr, and Mr. Purchase.—*The Times.*

Wireless Operators' Strike.—Developments. — *The Times* states that the Association of Wireless Telegraphists has announced its agreement to negotiate on the wages question, but will not advise the men to resume work while negotiations are in progress. The suspension of the order that vessels of 1,600 tons and above must have wireless installations and operators, has resulted in one or two cases in the refusal of crews to sail, causing inconvenience to passengers. The Joint Seafarers' Council has not "recognised" the strike, and other seamen are, therefore, "permitting" the employment of non-Union operators.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review, *in which the "Official Notice" appeared.*

OPEN.

Australia.—Sydney.—August 4th. N.S.W. Government Railways and Tramways. Two 1,000-kw. sub-station units. Chief Electrical Engineer, 61, Hunter Street, Sydney.

August 3rd. Department of Public Works. Turbines and generators for the Barren Jack hydro-electric development scheme. Department of Public Works, Sydney.

N.S.W.—Postmaster-General's Department. August 2nd and 5th. Aluminium sheet, brass rod, &c., scheduled 769 ; platinum wire, gold and silver wire, scheduled 768. (June 11th.)

Western Australia. — Postmaster-General's Department, August 3rd. 326 accumulators, schedule 668. (June 11th.)

Belgium.—June 26th. Municipal authorities of Bierset (Province of Liége). Tenders for the concession for supply of electrical energy for lighting and power purposes in the town.

Colne.—Electricity Department. Steam and water piping. (June 11th.)

Darlington.—July 16th. Electricity Department. One 5,000-KW. turbo-alternator and surface-condensing plant. (See this issue.)

Dartford.—June 26th. Electricity undertaking. Rotary converter, transformers, switchgear, &c., L.T. twin cable-feeder, pillar and feeder-panel. (June 11th.)

Edinburgh.—July 13th. Corporation. Electric lighting installations of houses at Gorgie. The Town Clerk.

Glasgow.—July 6th. Tramways Department. One 10,000-KW. steam turbo-alternator, with condensing plant. (June 18th.)

Huddersfield.—Electricians' work in girls' high school, Greenhead. H. Sutcliffe, Borough Architect, 1, Peel Street.

Hull.—July 12th. Electricity Department. One three-motor electrically-operated overhead travelling crane. (See this issue.)

Hoylake and West Kirby.—Coal for a year, for the Urban District Council Electricity Works. Electrical Engineer, Carr Lane, Hoylake.

Middlesbrough. — Corporation. Electric lamps and general stores. Town Clerk.

New Zealand.—AUCKLAND.—September 1st. Harbour Board. For the supply of electric capstans and spares. Messrs. W. & A. McArthur, Ltd., 18-19, Silk Street, Cripplegate, London.

Newport.—June 26th. Electricity Department. Turbo-alternating plant, surface-condensing plant, boilers, economisers, draught plant, steel flue and stack, &c. (June 4th.)

Nuneaton. — June 30th. Electricity Department. 1,000-KW., D.C., geared turbo-alternator, surface-condensing plant and pipework. (June 4th.)

Southampton. — July 3rd. Electricity Department. E.H.T. and H.T. switchgear and D.C. control panel. (June 4th.)

Swindon.—June 26th. Electricity Department. 2,000 yards 3-in. four-way stoneware conduits, light steel poles for overhead lines. (June 11th.)

Warrington. — June 29th. Electricity Department. Truck type ash elevator and hopper. (June 11th.)
July 13th. Electricity and Tramways Committee. Two 6,000-KW. turbo-alternators. (June 18th.)

CLOSED.

Belgium.—The municipal authorities of Horion-Hozemont (Province of Liége) recently invited tenders for the concession for the supply of electrical energy for lighting and power purposes in the town. Not a single offer was received.

Burnley.—The Electricity Committee recommends that the contract for the extensions, at the electricity works, be placed with the English Electric Co., Ltd., the total amount of their tender being £107,400.

Mansfield.—Town Council :—
Cables.—Western Electric Co., £9,898.

Southend-on-Sea.—Town Council :—
600 tubes and 300 bends for condenser.—Ledward & Beckett, £4,675.

Swansea.—Corporation. Accepted :—
British Thomson-Houston Co., Ltd.—Turbo-alternator, complete with condenser, £45,660.

Worcester.—Town Council :—
Messrs. Ward.—Electric bells for police cells, £13; electric fan, £49.

FORTHCOMING EVENTS.

Institution of Electrical Engineers. — Wednesday, June 30th. At the Institution of Mechanical Engineers, Storey's Gate, S.W. At 6 p.m. Paper on "Overhead and Live Rail Conductor Systems," by Sir Philip Dawson.
Thursday, July 1st. At the Natural History Museum, Cromwell Road, South Kensington. From 8 p.m. to 11 p.m. Annual conversazione.

Junior Institution of Engineers.—Wednesday, June 30th. At the Café Monico, Piccadilly Circus. 6.30 p.m. for 7 p.m. Dinner to celebrate 36th anniversary.

Tramways and Light Railways Association. — Friday, July 2nd. At Caxton Hall, Westminster, S.W. At 2.30 p.m. Annual congress. At 7.30 p.m. at the Connaught Rooms: Annual dinner.

NOTES.

The I.M.E.A. Meeting.—Continuing the report of the I.M.E.A. Convention, appearing on page 803, the proceedings were resumed on Wednesday morning. The paper by Mr. I. V. Robinson, Wh.Sc., of the B.E.A.M.A., on "Power Station Design in Relation to Thermal Efficiency," was discussed by Messrs. Carnegie, Selvey, Ferranti, Wilkinson, Swallow, Ayton, Lea, and Hunter. Mr. Robinson replied. In the afternoon an excursion to Bolton Abbey took place, also a golf handicap. Mr. Robinson's paper was contributed as the result of an invitation to the B.E.A.M.A. to give the views of manufacturers. Copies of the specifications and tests agreed between the B.E.A.M.A. and the Association were circulated at the meeting.

Industrial Research.—The Department of Scientific and Industrial Research has approved the Research Association for the British Motor Cycle and Cycle Car Industry. The Secretary of the Committee engaged in the establishment of this Association is Major H. R. Watling, "The Towers," Warwick Road, Coventry.

Vulcanised Rubber.—A new vulcanising process has been invented by Mr. S. J. Peachey, of the Manchester College of Technology. It is stated that instead of the usual high temperatures, the new method employs sulphuretted hydrogen and sulphur dioxide at ordinary temperatures. The process will enable a large class of materials to be treated, which could not be used previously on account of the high temperature involved.

Electricity on South African Farms.—None can doubt the complete present supremacy of the oil engine as a power motor on South African farms, withthe wind motor—invariably of foreign manufacture owing to the strange indifference of British makers—a good second. Nevertheless, there are signs that these will soon be faced with a growing competition from small and self-contained electrical plant. Attention is just now being vigorously drawn to the waste of water power in the numerous districts where it is available, and useful attempts are being made to educate the agriculturist as to the possibilities open in this direction. The common impression has hitherto been that a greater and more forceful flow is required than can be continuously relied upon from the average small stream, and the farmer has yet to learn how small and irregular a flow will give a sufficient horse-power to work a plant capable of driving big farm and dairy machines, and also lighting a homestead. Little or no conception exists of the high peak loads obtainable by the use of the storage battery on a low, but more or less continuous, rate of feed. As information on this subject spreads, we foresee a widely-extended demand for small electricity-generating plant in the farming districts of every part of South Africa.

The subject is one which may well engage the practical attention of machinery importing firms, which should be assured of the sympathetic co operation and support of Home manufacturers of the type of plant referred to. The South African farmer was never before so prosperous or in such a good position to spend money on new ideas and developments. All that is needed is a certain amount of propaganda, both by advertising and personal advice, and he will see the important economies and facilities he can effect by utilising the power now generally running to waste. With a stream 10 ft. wide, from 2 ft. to 4 ft. deep, and with about 5 ft. head, the farmer has a free supply of something like 20 H.P., but the trouble is that in few cases does he know this. The opportunity open to machinery firms strikes us as an extremely valuable one, the more so because the commercial opportunities are not limited to the handling of small dynamos and the necessary material, but the door is opened to a new and highly-profitable business in lighting fittings and such domestic conveniences as electric fans, irons, washing machines, and cooking and heating apparatus. Such plants are not unknown in South Africa. Isolated cases exist where enterprising farmers have had them in successful operation for some years. Such cases are certain to multiply, and the commercial opportunities involved will be recognised and fostered by wide-awake firms. In fact, one such house in British East Africa, holding an American agency, has been making a big push lately with electric motors adapted for agricultural purposes, and, we believe, with considerable success. South Africa should provide a still larger field if similar propaganda were pursued in districts offering the necessary water-power facilities, and, in spite of popular misconceptions, it should be realised that there are few which do not.—*B. and S.A. Export Gazette.*

U.S.A. Production of Electric Power and Fuel Consumption.—Data collected and compiled by the Committee on Division of Power Resources, United States Geological Survey, giving the production of electric power and consumption of fuel by public utility plant in the United States for the month of January, 1920, show an increase of approximately 15 per cent. over the figure for the same month in 1919. The figures for January are based on returns received from about 2,800 power plant of 100-KW. capacity or more engaged in public service, including central stations, electric railways and certain other plant which contribute to the public supply. The capacity of plant submitting reports of operations is about 90 per cent. of the capacity of all plant. The average daily production of electricity during January was 124,300,000 KW.-hours, 33 per cent. of which was produced by water power. The total production of electricity by public-utility plant during 1919 was 40·3 billion KW.-hours, 14·76 billion KW.-hours, or 36·6 per cent. by water power, and 25·54 billion KW.-hours,

or 63·4 per cent. by fuels. The mean daily output for 1919 was 110·4 million KW.-hours. The mean daily production for January, 1919, was about 108 million KW.-hours; the mean for January, 1920, was 124·3 million KW.-hours. The value for January, 1919, is estimated. The fuel consumption for the year was as follows:—35 million short tons of coal, 11·05 million barrels of oil, and 21·7 million M. cb. ft. of gas. Converting the oil and gas consumed to coal, the equivalent coal for all fuels consumed during 1919 would be 38·347 million tons. With 25·540 billion KW.-hours, produced by fuels in 1919, an average of practically 3 lb. of coal was required per KW.-hour of electricity produced. On this basis it would have required the consumption of 22,140,000 tons to have generated the KW.-hours produced by water power. The estimated production of bituminous coal in 1919 is 458,063,000 short tons. The amount of coal used by electric public utility plant during 1919 was 7·6 per cent. of the total produced.—*Power.*

Charges for Electricity Supply and Wages of Employes.—The following is a copy of a letter addressed to the secretaries of the Home Counties (No. 9 area) Joint Industrial Council for the Electricity Supply Industry, by the Ministry of Transport:—

COPY.

Ministry of Transport,
Secretarial and Legal Department,
6, Whitehall Gardens, S.W. 1.
June 14th, 1920.

GENTLEMEN,

I am directed by the Minister of Transport to refer to Mr. Webb's letter of the 13th ult., and to the copy of the resolution passed by the Home Counties Council on May 12th, 1920, and also to the conference which Sir John Snell had with a deputation from the Industrial Council on the 19th ult.

The Minister has decided that companies seeking an increase in their maximum rates of charge may now make application to him under section 32 of the Electric Lighting (Clauses) Act, 1899, instead of under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918. This will enable all companies with very few exceptions to make application should that course be necessary. The few exceptions are those companies whose orders were granted to local authorities prior to the passing of the 1899 Clauses Act, and subsequently transferred to the companies.

Such companies and local authorities to whom Section 32 of the Act of 1899 does not apply may make application under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918.

The Commissioners will conduct any inquiries that may be necessary, and they will be always willing to hear any representations which the Industrial Council for the district may desire to make, and the Industrial Council for the district will be notified when any application for an increase of charges is made.

With regard to the second point raised by the deputation, I am to say that the Minister has no power to allocate to any particular purpose any part of the sum produced by the sanctioned increase of maximum charge, but representatives of the Industrial Council can attend any inquiry and be heard thereat.

As regards the third point raised by the deputation, I am to state that the Minister is advised that he cannot restrict the grant of an increase only to undertakers who agree to carry out the recommendations of the Industrial Council.

I am, Gentlemen,
Your obedient servant,
(Signed) R. FRANCIS DUNNELL.

The Joint Secretaries,
Home Counties (No. 9 Area) Joint Industrial Council
for the Electricity Supply Industry.

The Costs of Gas Fittings.—The electrical engineer, with characteristic modesty, and a lively remembrance of the time when new houses were fitted for gas with a mixture of small iron and compo pipes held up for the most part by the plaster, is apt to assume that his wiring estimates are still much in advance of the expenditure called for by his competitors. Only a few years ago small houses were wired in carcass for 8s. to 10s. a point, without fittings, and gas could be run for half that amount. To-day, however, it would appear that high cost of installation and of apparatus is a more serious difficulty to the gas engineer than to ourselves, checking the popular wiring schemes and radically altering the relation between the cost of gas apparatus and the revenue to be derived from its use. A correspondent of the *Gas Journal* recently complained that a speaker had given a figure of £1 per point as the present cost of simple gas installation work, including inverted pendants, burners, outlets for fires, cooker, &c., at the same time stating that the lowest tender known to him for electric wiring without fittings was 25s. per point; whereas the correspondent considered that it could not be done with material up over 100 per cent.; wages of gas fitter 1s. 9d. per hour; wages of gas fitter mate 1s. per hour. The results were given of two houses piped in carcass to determine the costs for 600, as follows:—

Houses: 3 bedrooms, parlour, living room, scullery, bathroom, usual offices.

Points: 10 lighting, 1 cooker, 1 hot water, 4 fires; total, 16.

Net cost without establishment charges, supervision, use of tools or waste, £12 6s. per house.

FITTINGS.	£	s.	d.
1 2-light pendant		14	6
2 Burners at 5s. 4d.		10	8
8 1-light pendants at 5s. 6d.	2	4	0
8 Burners at 4s. 8d.	1	17	4
10 Mantles at 6d.		5	0
10 Patteresses at 6d., labour, &c.		5	0
	£5	16	6

or a total of over £18 actual net cost for a house with 16 points, only the lighting points being completed with fittings. It would appear that after providing the cooker, water heater, and fires, an expenditure approaching £50 per house might be anticipated.

The Fiat Motor-car Works.—When the Italian automobile industry is under consideration, Italy's lack of coal is often cited as one of the handicaps which will prevent the industry attaining the same development as that of other nations more favourably situated in this respect, but Italy has been so favoured by nature in the matter of water power that coal can almost be dispensed with. There is proof of this in the Fiat motor works, which, whilst being one of the largest in Europe, are also completely electrified, the whole of the electrcity being obtained from water power in the Alps. At the present time no coal whatsoever is used for driving machinery. For power and light the big works of the Fiat Company consume 15,000 KW. daily, out of a total consumption of 50,000 KW. for the whole of the city of Turin. When the new steel works and the forges were laid out, they were designed to be operated entirely by electricity secured from water power; the electric furnaces, in particular, are very fine. The essential features of these furnaces are the subject of a Fiat patent, and excellent results are obtained. It was in 1917, soon after the Fiat Company had bought up the Piemontaise steel works and forges, that the problem was tackled of securing sufficient hydraulic power and designing such a plant that no coal whatsoever would be required in the big Turin factory. Control was obtained of the Mont Cenis Hydraulic Power Co., which, by reason of its topographical and geological conditions, offered good possibilities for obtaining electricity. The plant existing at that time on the Cenischia River was able to supply 65,000,000 KW.-hours, of which 38,000,000 were available in summer and 27,000,000 during the winter months. This quantity will be considerably increased in the near future, for extensive works are being carried out on the Cenischia River. In addition to this, by increasing the size of the natural lake on the top of the Mont Cenis, the power available will be increased to 200,000,000 KW.-hours, of which a large portion will be available during the winter months. When these extensions have been completed, the whole of the electricity produced by the Mont Cenis Electric Power Co. will be reserved for the Fiat motor works at Turin.

Electro-deposition of Iron.—In a paper recently read before the Institution of Automobile Engineers, Mr. B. H. Thomas gave an interesting account of the progress of repairing or building up worn motor parts by means of electrically deposited iron. Ball race housings, stub axles, and the various other parts that, subject to continuous wear, become slack must, under ordinary circumstances, either be allowed to run on to the detriment of the engine in general or on the other hand must be replaced—a costly alternative. In such cases the only satisfactory remedy is the deposition of copper or iron, and it has been found possible to coat with a layer 2 mm. thick any cylindrical wrought iron or steel surface. Properly done this layer cannot be chipped off with a chisel, and when carbonised and hardened the dividing line, shown by micro-photographs, entirely disappears. The surface can be filed or ground and given a high finish. At the Third Heavy Repair Shop, described by the writer, 6,000 parts were rendered serviceable by this method in less than two years, and several examples of the various types of work are given in the paper. The plant consisted of two depositing benches with 24 depositing vats each and a large vat for simple repetition work; machine tools for finishing off repairs; two electrolytic cleaning vats; a set of accumulators coupled in groups for 2, 4, 8 and 12 volts; three ½ H.P. motors for rocking anodes, besides other necessary smaller appliances. The method of working is detailed by Mr. Thomas. The importance of properly cleaning the material is emphasised by the fact that it is put through seven stages, including two electrolytic baths. Any portion of the work to be left as it stands is then stopped off by means of wax or a similar composition. The bath that gave the most satisfactory results was composed of 75 grammes of ferrous ammonium sulphate to 1 litre of water, with a current density of 1 amp. per 30 sq. cm. The work is suspended in the vat from a standard fixed to the bench, and in order to ensure a uniform deposit the anode is moved about the work by means of a small motor. The best anode proved to be that made up of 16 S.W.G. Swedish iron wire wound into the form of a cylinder and thoroughly annealed. The temperature of the solution should be kept above 68 deg. F., and it is desirable to decant and settle it every three days or so to remove oxides of foreign matter which cause roughness in the deposited metal.

The Cracking of H.T. Insulators.—A writer in *Elektrotechnik und Maschinenbau*, discussing this question, points out that cracking in petticoat H.T. insulators is nearly always caused by the cement used in cementing the different parts together (he is, of course, speaking of built-up insulators). Most ordinary cements become very hard with time, and having a different thermal expansion to the porcelain used, they cause the latter to become mechanically stressed, and so cause cracking and breaking when the insulators are heated up. A number of firms use an elastic compound between the cement and the porcelain, but here also the same trouble is experienced with the lapse of time, as the elastic medium also oxidises and hardens. The remedy suggested by this article is to add to the cement (only the best Portland cement should be used) materials having a lower thermal expansion than the cement, so that the thermal expansion of the compound is reduced to approximately the same value as that of the porcelain. A compound of this type, termed "Teleo" cement, has been patented by the Porzellanfabrik Freibergi. S., and has given very satisfactory results in use. It has also a higher mechanical strength than pure cement.

E.P.E.A. Bonus of £30.—We understand that a situation of serious concern to the inhabitants of Derby, Nottingham, and Leicester was recently created by the Councils in these boroughs on account of their not agreeing to pay the above bonus in accordance with the recommendation of the National Joint Board of Employers and members of staff (Electricity Supply Industry). The members concerned, supported by the E.P.E.A., had intimated their intention of withdrawing their services on Friday last, if the Councils did not reconsider their decision and agree to pay the bonus as recommended. We are glad to state that the Corporations have since reconsidered the matter and have decided to pay the bonus to the technical staffs, as from January 1st, 1920.

Appointments Vacant.—Armature winder, for the Oldham Corporation Tramways; foreman (Rs. 500 per week), for the Ammunition Power House, Kerkee, India; meter superintendent (105s.), for the Loughborough Corporation Electricity Department; mechanical and electrical engineer, for the Yorkshire Electrical Power Co.; resident electrical engineer (£450) for the Borough of Wrexham Electricity Department; mains and meter assistant for Alloa Town Council Electricity Department. See our advertisement pages to-day.

INSTITUTION NOTES.

Institution of Electrical Engineers.—There was a good attendance of members on June 16th, when Sir Dugald Clerk, K.B.E., &c., read his "Note on the Thermal Efficiency of the Generation and Use of Gas and Electricity." The subsequent discussion, which will appear in a later issue of the ELECTRICAL REVIEW, raised points of great importance. Among the speakers were Messrs. Merz, Highfield, Patchell and Wordingham, Colonel Crompton, and Profs. Cobb and Smithells.

STUDENTS' SECTION.—The London Students' Section of the Institution is to visit Scotland this summer from July 24th to 31st. An attractive programme has been arranged, which will include social functions and visits to power stations, works, and other places of interest at Glasgow and Clydebank.

Institution of Civil Engineers.—A conversazione is to be held at the Institution, Great George Street, S.W., on Tuesday, July 6th, from 8.30 p.m. to 11 p.m.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

MR. OSWALD G. COOK, late assistant electrical engineer at H.M. power station, Ripon, has been appointed a director of Messrs. Arthur Cook, Ltd., hauling contractors, Leeds.

The Council of the Royal Society of Arts has awarded medals for the following papers read during the session 1919-20:—MR. SYDNEY PRESTON, C.I.E., "English Canals and Inland Waterways"; SIR JAMES CURRIE, K.B.E., C.M.G., "Industrial Training."

MR. A. E. FIRTH, of the Camp power station at Ripon, has been appointed shift engineer at the York electricity works.

MR. J. ALLAN WILSON has resigned his position as branch manager of Messrs. Johnson & Phillips's Glasgow office, as from June 30th.

The Highways Committee of the London County Council recommends that MR. J. R. WALKER, assistant power-station engineer in the tramways department, be appointed inspecting engineer, at a salary of £410 a year, plus war bonus of 20 per cent., plus £120, making £648.

The marriage took place at Tunbridge Wells, on June 14th, of MR. FRANK ABBOTT, of the staff of the General Electric Co., Ltd., and Miss B. K. Maxwell, daughter of the late Mr. W. Maxwell, of London and Chicago. From his colleagues, Mr. Abbott received a silver coffee service.

Ayr Town Council has granted the electrical engineer a bonus of £150, and the tramway manager a bonus of £135, into which all war bonuses are merged.

MR. W. C. MALLINS, general manager of the Liverpool Corporation tramways, was presented on his retirement with a silver rose bowl, salver, and vases, at a luncheon given by the chairman of the Tramways Committee (Councillor F. C. Wilson), at the London and North-Western Hotel, Liverpool. Warm tributes were paid to his work as tramway manager.

Kilmarnock Town Council has appointed MR. J. H. MENZIES, of Dundee as tramway manager.

Obituary.—MR. CECIL TREHERNE, who was killed by lightning on June 12th, was an apprentice to electrical engineering with the British Westinghouse Co., at Manchester, and was about to enter Manchester University to take an engineering degree. He was 19 years of age.

MR. T. GOODYEAR.—The death has taken place of Mr. Thomas Goodyear, who was for over 24 years electrical engineer to the late Lord Nunburnholme, at Warter Priory (Yorks.). He was 63 years of age.

MR. JOHN COOPER.—We regret to record the death of Mr. John Cooper, accountant, who was in the employ of the Edison Swan Electric Co., Ltd., for 30 years.

Will.—Mr. H. P. SMALLPEICE, chairman of the Guildford Electricity Supply Co., Ltd., left £138,265 gross and £114,424 net personalty.

NEW COMPANIES REGISTERED.

Greenling Electric Supplies, Ltd. (168,255).—Private company. Registered June 14th. Capital, £5,000 in £1 shares (4,000 participating preferred). To carry on the business of electrical, mechanical, motor and general engineers, manufacturers of and dealers in transformers, radiators, dynamos, motors, &c. The subscribers (each with one share) are: W. H. Roslington, 15, Duke's Avenue, Chiswick, W.4, merchant; H. W. Humphries, 23, King Street, Cheapside, E.C., C.A. The first directors are: W. H. Roslington (governing director) and others to be appointed by him. Solicitor: E. J. B. Hobrow, 9, Ironmonger Lane, E.C.

Garner, Holt & Co., Ltd. (168,355).—Private company. Registered June 17th. Capital, £5,000 in £1 shares. To take over the business of an electrical engineer and constructor carried on by G. Garner at 2, Grange Terrace, Wilmslow Road, Rusholme, Manchester, as "Garner, Voyce & Co." The permanent directors are: G. Garner, 2, Grange Terrace, Wilmslow Road, Rusholme, Manchester, electrical engineer; A. O. Holt, 2, Grange Terrace, Wilmslow Road, Rusholme, Manchester, electrical engineer. Solicitor: S. Bishop, 23, Fountain Street, Manchester.

Northern Radiators, Ltd. (168,201).—Private company. Registered June 11th. Capital, £5,000 in £1 shares. To carry on the business of radiator manufacturers, motor, electrical and general engineers, &c. The subscribers (each with one share) are: E. C. Q. Henriques, 477, Bury New Road, Manchester, engineer; K. Howell, 83, Stockport Road, Marple, clerk. The subscribers are to appoint the first directors. Qualification, £100. Secretary: E. C. Q. Henriques. Registered office: Sheepscar Street, Leeds.

Industrial Electroplant, Ltd. (168,192).—Private company. Registered June 11th. Capital, £2,000 in £1 shares. To carry on the business of manufacturers of and dealers in electric and galvanic machinery, motor cars, motor and other cycles, aircraft, range finders, steering gear, gyroscopes, dynamos, cables, switchgear, &c. The subscribers (each with one share) are: F. C. Austin, Thorncroft, Warlingham, Surrey; H. A. Rawlin, 179, St. James' Road, S.E.1. The first directors are: F. Pooley, E. C. Austin, W. L. Wreford, F. Creedy and H. St. Hill Mawdsley. Registered office: 34, Broadway, Westminster, S.W.

Sinclair, Paget & Co., Ltd. (168,209).—Private company. Registered June 11th. Capital, £2,000 in £1 shares. To take over the business of electricians, electrical engineers, &c., carried on by G. F. A. Paul at 8, New Inn Yard, Shoreditch, E.1. The first directors are: W. P. St. John, 151, Fore Street, Edmonton, N.18, accountant; G. F. A. Paul, 32, Falmer Road, Enfield, electrical engineer; L. Lambert, 21, Aldebert Terrace, Clapham, S.W.8, accountant. Secretary: L. Lambert. Registered office: 8, New Inn Yard, Shoreditch, E.1.

Fred Price & Co. (1920), Ltd. (168,229).—Private company. Registered June 12th. Capital, £50,000 in £1 shares. To carry on the business of electrical engineers and contractors, mechanical engineers, &c. The subscribers (each with one share) are: R. Lane, 3-4, Duke Street, Cardiff; F. Price, 9, Gold Street, Cardiff; A. W. Horton, 29-31, St. Mary Street, Cardiff; C. W. King, Pentre Gwylim, Llanishen. The first directors are: Sir Edward Nicholl, Sir Wm. Diamond, R. Lane and C. W. King. Secretary: T. C. Evans. Solicitors: Forsdike, Buchanan and Giles, Cardiff. Registered office: Institute Lane, Park Place, Cardiff.

Bougie Pognon, Ltd. (168,249).—Private company. Registered June 14th. Capital, £100 in £1 shares. To acquire and turn to account the patent and trade mark relating to the Pognon sparking plugs. The subscribers (each with one share) are: A. Peters, 4, Mount Road, Wimbledon Park, S.W.19; A. Keston, Westgrove, 339, Amhurst Road, Stoke Newington, N.16, clerk. The first directors are to be appointed by the subscribers. Solicitor: A. Baker, Lennox House, Norfolk Street, Strand, W.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Accessories Manufacturing Co., Ltd. (Old Co.).—H. A. McCann, of 8, Queen Street, E.C.4, ceases to act as receiver or manager on June 8th, 1920.

Penrith Electric Supply Co., Ltd.—Satisfaction in full on April 29th, 1920, of mortgage dated December 5th, 1918, securing all moneys due or to become due from the company to bankers.

Kent-Mitchell, Ltd.—Satisfaction to the extent of £1,000 on February 20th, 1920, of debentures dated July 11th, 1919, securing £3,000.

Llanrwst Electricity Supply Co., Ltd.—W. J. Parry, of Caetmor Chambers, Bethesda, Carnarvon, as receiver and manager by order of Court dated May 21st, 1920.

F. E. Baker, Ltd.—Particulars of £10,000 debentures created May 19th, 1920, whole amount being now issued, charged on the company's undertaking and property, present and future, including uncalled capital.

Honiton & District Electric Supply Co., Ltd.—£500 debentures dated May 25th, 1920, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: C. Harding, Burwood, Honiton, and others.

Llangollen & District Electric Light & Power Co., Ltd.—Debentures, and as collateral security, a mortgage, both dated May 13th, 1920, to secure £1,000, charged on company's undertaking and property, present and future, and lease of portion of Deel Mills, Llangollen, with powers therein granted to install dynamos and generators, &c. Holders: E. F. Jones, Llangollen, Denbigh.

W. Saunders, Ltd.—Mortgage dated May 20th, 1920, securing £2,200, charged on 24, 26, and 28, Crouch Street, Colchester. Holders: Miss F. Fitchett, Halstead; W. J. Hankin, 3, Winchester Street, Basingstoke; and F. V. Hankin, Ash Cottage, Clarence Road, Fleet, Hants.

Lancashire Dynamo & Motor Co., Ltd. (61,447).—Return dated December 31st, 1919. Capital, £250,000 in £1 shares (200,000 ordinary and 50,000 preferred), 150,000 ordinary and 48,800 preferred shares taken up. £198,800 paid. Mortgages and charges, £75,000.

CITY NOTES.

Lancashire Power Construction Co., Ltd.

As a result of the Parliamentary Co.'s operations for the year 1919 that company has, after paying debenture interest and putting £15,000 to reserve, declared a dividend of 7 per cent. upon its shares, all of which are held by this company. This will produce £35,660, plus £4,500 interest on the debenture held by this company, plus interest, &c., received £1,317, making £41,477. Debenture interest payable, general expenses, &c., absorb £17,219, leaving £24,258, plus £8,441 brought forward. Dividends of 6 per cent., tax free, on the cumulative convertible first preference shares, 7 per cent. on the 7 per cent. cumulative participating preference shares, and 6 per cent. on the ordinary shares, are to be paid, leaving £9,648 to be carried forward. To enable the extension of the generating station and mains of the Parliamentary Co. to be proceeded with, the company in December last made an issue of 400,000 6 per cent. cumulative convertible first preference shares of £1 each. The following figures indicate the development of the Parliamentary Co.'s business during the year:—

	1918.	1919.
Units generated	49,581,893	50,671,536
Maximum load in KW. ...	14,000	18,600
H.P. connected	35,500	39,000
Receipts	£136,745	£173,338
Expenditure	£88,731	£119,960
Profit on trading	£48,014	£53,378

Owing to the change from war to peace conditions, and especially to the reduction in working hours in practically all industries, the Parliamentary Co.'s output has not quite maintained the normal rate of expansion, but in spite of many difficulties the trading result has improved, and the Parliamentary Co. has been able to increase its dividend to this company from 6 to 7 per cent. New contracts entered into during the year, which are now maturing, will have the effect of approximately doubling the company's output as soon as the plant on order is in commission. In addition inquiries have been received considerably in excess of the company's capacity to supply, even when the present extensions are completed. These inquiries are receiving the careful consideration of the board. The continued high price of coal has brought home to power users in every industry the great advantages of central electric power supply. The extensions at the power station, although somewhat behindhand, are now making good progress, and it is hoped that the first of the two 10,000 KW. sets on order will be operating in October, and the second about four months later; labour difficulties, and particularly the moulders' strike, are responsible for the delay in the delivery of the new plant.

Delhi Electric Tramways and Lighting Co., Ltd.

Mr. A. W. Tait, C.B.E., in the course of his speech at the annual meeting, said that the accounts were the most satisfactory since the formation of the company. The position had been strengthened, and the first dividend on the ordinary shares was recommended; the preference shareholders began to get some return in respect of their participating right. They had received considerable assistance to these ends from the profit obtained on remittances to this country (£7,127), an abnormal circumstance, which they could not expect to be repeated to the same extent in the current year. The satisfactory feature of the accounts was the increase in the revenue from both branches of the undertaking. This would have been greater but for the complete boycott of the cars which took place in April, 1919. The net revenue increased by 13 per cent. It was inadvisable to increase the tramway fares, but they were considering slight increases in the lighting and power rates. There had been a slight fall in the cost per unit generated due to an improvement in the freight charges on oil fuel. They were making arrangements to cope with the demand which was expected during the coming winter. There would be an exceptional demand during the visit of the Prince of Wales. Despite the difficulties of obtaining electrical materials of all kinds, 195 consumers were added, against 117 in the previous year. As they had been able to obtain better supplies of materials the new consumers this year showed a further substantial increase. They had selected a type of car which was at present before the municipal authorities for approval. Rolling stock was costly, and there was difficulty in obtaining delivery and accommodation to India, so they might not be able to supplement their rolling stock to any material extent for some time. It was too early to give a reliable estimate of the prospects for the current year, but the returns so far to hand showed that if conditions remained normal they might hope for as good a result as that now submitted so far as the net revenue of the combined undertakings was concerned—leaving out of account the question of exchange. The general manager, Mr. Griffin, was returning to this country for a rest owing to the state of his health. It was improbable that he would be able to return to India for any extended period, and they would have to consider the question of a successor at an early date.

Greenwood and Batley, Ltd.

Col. O. C. Armstrong, D.S.O., presiding at the annual meeting on 15th inst., said that regarding future prospects they need have no anxiety as to orders; they were in the fortunate position of being able to pick and choose their orders, though under existing conditions this was not always an infallible indication of results. The many factors which might intervene between the acceptance and the completion of a contract were at present abnormally indeterminate, and these in turn were aggravated by the crushing effect of prospective taxation. It was confidently anticipated that within eighteen months of the actual conclusion of the war they would all be in a position to reorganise and develop to their fullest extent the industrial powers of this country. Everyone accepted that industry would have to bear its full and direct share in the taxation necessary to liquidate the vast debt that had been incurred, since, carried to its ultimate conclusion, industry, directly or indirectly, in one form or another, would eventually have to find by far the greater part of the money required for the repayment of the war debt. It was, however, generally and justifiably assumed that in course of time a wise and statesmanlike policy would be initiated which would adjust the burden of taxation in such a manner that it would leave the most important factor in this country, the manufacturing industry, the freest possible use of all its powers of development both in the home as well as in foreign markets. So far from this being the case we are apparently to have an extension of the E.P.D. in an aggravated form—an inequitable and deleterious form of taxation admissible at best as a temporary expedient under war conditions, where the Government practically consumed or controlled the entire output of our factories, and mass production of standard articles was more or less universal. The orders already booked were sufficient to keep all the various departments in the works fully employed for the next twelve months, and, given freedom from labour troubles and loyal co-operation of the men, he thought they could look ahead, in so far as the immediate future was concerned, without any cause for anxiety. A very fair proporiton of the orders are for export, and they found many of their old customers from abroad were again asking them to supply their needs.

Callender's Cable and Construction Co., Ltd.

Sir J. Fortescue Flannery, M.P., presided on June 17th at the Hall of the Institute of Journalists over the annual meeting. He said the results were extremely satisfactory, and when it was remembered that they were achieved in the face of unusual difficulties, they were all the more gratifying. The war had made things difficult for the company, but they had had one steady customer in the Government, who had taken the greater part of their output to the great advantage of both the Admiralty and the War Office. As a result of the suspension of hostilities the Government stopped its war orders within 24 hours, and left on the company's hands large quantities of practically manufactured materials, and a factory which had been built to meet its special requirements. Their original factories, as they had been converted again to meet the special requirements of the Government, were to a large extent in a condition unsuitable for commercial work. The problem left to the company, therefore, was to obtain orders sufficient to fill the works, rearrange the factories to make such work profitable, and at the same time in order to keep their promise to re-engage and re-employ over 800 men. These briefly were the conditions under which they began in 1919, and it was testimony to the inherent strength of the company that first its world-wide agencies, secondly, its sales organisation, and last, but not least, the skill and grit of its management, led by Sir Tom Callender, enabled it to secure the orders, deliver the goods, and obtain the profit which was shown in the accounts. The profit was made between January 1st and December 31st, 1919, and so went to the credit of the whole year, but a large part of the year had elapsed before the changes required by the altered conditions of manufacture were completed, and although the factories were turning out cables in large quantities during the whole of 1919, obviously they could not do so efficiently, and consequently profitably until the changes

in equipment and organisation were completed. The profit made was, therefore, earned after these changes had been made, and consequently during a portion only of the year under review. The present year was handicapped by no such difficulties, and they expected corresponding improvements in the results. Attention was drawn in the report to the re-arrangement of the factory routine, owing to the working week having been reduced to 47 hours, *i.e.*, by over 10 per cent. The volume of orders recorded was colossal, and quite beyond the capacity of the factories at the present time working for 47 hours a week only, and it was clear that the fullest and most complete employment of the plant must be obtained to achieve the delivery to time of the large contracts for cable which were placed in their hands. Negotiations were opened with the men's unions, and the whole situation explained, reviewed, and discussed, and, after prolonged and difficult negotiations, a scheme of rotary shifts for the cable shops was formulated and agreed, so that the cable works could, to all intents and purposes, keep up a continuous process of manufacture. Such an arrangement enabled them to deal with the extraordinary volume of orders received, and to a limited extent effect some improvement in the cost of manufacture. In this connection, however, the higher rates of pay and the lower efficiency of night work had to be set off against some reduction in general charges per ton of cable manufactured following, as such reduction should follow, upon continuous operation of their plant. All this augured well for the company's future, and forecasted even better results than those shown in the accounts. The volume of orders received after the cessation of hostilities had been prodigious, large contracts had been secured, and others were apparently coming their way, the output of the work was continuously increasing, and, moreover, a new factory had been erected at the Erith works to manufacture super-tension cable for 33,000 to 60,000 volts. Until comparatively recently voltages higher than 11,000 volts were not employed in this country. Now that the supply and application of electricity was increasing so enormously, huge stations were built to distribute current over large areas, higher pressures were employed, and the demand for super-tension cables was already urgent, and was obviously bound to develop. Their employment, however, was not restricted to this country. In every part of the world where electricity was developing the same demand was arising, and as they intended to obtain their share of the orders, they had designed and built a factory especially to manufacture efficiently this class of cable. The factory was now complete, and would commence operations immediately. The prospects of the company as they found them to-day were never more hopeful. The books were full of orders, works were operating efficiently, and the new factory was ready. The network of agents throughout the country and abroad poured into the headquarters a steady stream of inquiries and orders, and the difficulty was not to obtain work, but how to avoid "biting off more than we can chew." The directors intended to seize the opportunity now before them to drive ahead the enterprise for which they were responsible, along the path of even more successful progress. To do so, however, financial resources beyond those already possessed by the company were necessary; and, in a few days' time, the board would appeal to the public to provide them with further funds to develop this successful business towards an even greater financial return. The general terms of the issue were known to them. They were 400,000 7½ per cent. "B" preference shares of £1 each at par, and 100,000 ordinary shares of £1 each at 22s. per share—terms attractive enough, it seemed to them, in themselves to ensure the same great success as occurred in their issue of 1918, which was subscribed nine times over. Supported, however, by the results and the favourable prospects which they had indicated, the new issue should induce shareholders to take a still greater share in the successful enterprise they owned. Touching on the accounts, the chairman said that the balance to the credit of profit and loss account was £161,000, as compared with £134,000 a year ago. After provision for interest on debenture stock, dividend on preference shares, and depreciation, and adding the balance brought from 1918, there was an available total of £198,000, as compared with £184,000 a year ago. They were carrying to special reserve for war taxation £33,000, and after payment of a dividend for the year of 15 per cent. on the ordinary shares, they were carrying forward £105,000. Referring to the reserve for war taxation, he said that the excess profits duty at 60 per cent. was a terrible impost on industry; it must tend to check enterprise, and must cripple industry to a considerable extent. That crippling process affected every company, and this company, of course, did not escape. It was to be hoped that the discussions which were now going on might enable the Government to see their way to some reduction of this very serious taxation.

Sir T. O. Callender (managing director), in seconding the motion, said that 1919 has admittedly been a year of great effort and very hard work, in view of the change of circumstances under which the company had had to operate, and he wished to acknowledge the great help he had received from all the members of the staff during this trying time. In every direction they had endeavoured to push the interests of the company. They had opened up new connections, although they had very large ones already existing before the war, and an interesting item he might mention in this connection was that in the somewhat unlikely country of Ireland they had succeeded in opening up a small but satisfactory business account. They had pushed ahead in South America, where they had opened their own offices on the West Coast with what he hoped would be very satisfactory results. They had widely extended their field of operations in India, and he was confident there would be much business to the good of the company there. The new factory for the manufacture of super-tension cable would relieve the strain on the existing workshops to a considerable extent, and give them an entirely new field of operations. He hoped that before the present month closed they would be actually making this cable in the new shops, and he was sure the results would in every way justify the considerable expenditure incurred. There was still room for improvement in their output. He desired to say, however, that the relations which prevails between the company and their men—especially in their cable shops—were friendly and wholesome, and by the working of the Whitley Council they got into very close touch with each other without the necessity of disputes which had been very unfortunate in some trades, though not in their own, in the past. From all this, and from his knowledge of what was being done, he saw ahead ample work for the company for some time to come, and unless some great disaster occurred to stop all industry throughout the world, he felt sure that the electrical cable manufacturing of which this company stood at the very head, would find during the next three or four years, at any rate, ample scope for all that it could do.

United River Plate Telephone Co., Ltd.

Sir Frederick Green, K.B.E., presided at the annual meeting, last week. He said that the net results, though somewhat less than those of 1918, were decidedly satisfactory considering the position of the world's business everywhere. The earnings in Argentina and London amounted to £976,168, an increase of 7½ per cent. But, on the other hand, maintenance and other expenses of management in Argentina and London increased by 24 per cent., resulting in a profit of £212,092, a decrease of £80,407 as compared with 1918, or 27½ per cent. Negotiations were in progress for obtaining permission to increase their rates, and they had reason to hope that their request might soon be granted. As regards Argentina, the increase in working expenses amounted to £127,097, of which 50½ per cent. was represented by increased operators' wages, 19½ per cent. by increased cost of plant maintenance, and the balance, 30½ per cent., by increased cost of administration, taxation, and sundry other items of management. They had to set against this increased expenditure an increase of £66,151 in earnings, making the net decrease for the year in Argentina £60,946. The London expenditure, including income tax, amounted to £105,167—a considerable increase over 1918, but one which was almost entirely due to increased income tax. The addition to the plant account was £148,236, and to real estate £53,783. The latter item was principally due to payments on account of a new building in the city of Buenos Ayres now nearing completion, which would eventually house two 10,000-line exchanges, as well as provide accommodation for a number of the staff. Stocks of material stood at £207,464, nearly double the figure for 1918, and were largely due to heavy shipments during the latter part of 1919 for the purpose of capital extensions. Higher prices, too, played their part in the increased value of this asset. The shortage of materials still prevented them from doing as much renewal work as they desired. At the present moment the waiting list in the city of Buenos Ayres numbered considerably over 5,000, which it would be impossible to reduce to any extent until the additional switchboards (some of which were now in course of erection) were completed. These new switchboards, however, with the exception of one, were merely additions to existing exchanges. To provide the further telephone facilities which were urgently needed, but which during the war years they could not supply, it had been necessary for the company to prepare schemes for altogether new exchanges in other parts of the capital. Accordingly, it had to be decided whether the present Central Battery manual system should be continued for these new exchanges, or whether they should adopt the automatic system which they had had in use for some years in Cordoba and Rosario. Until recently there were difficulties in connection with the introduction of an automatic system into a city where telephone service was already being given by manually-operated exchanges, but these difficulties had now been overcome, and so, after careful consideration, they came to the decision to adopt the automatic system, and had therefore ordered one of the Strowger type, similar, in the main, to that in use at Cordoba and Rosario. It was being manufactured in England, and it was hoped delivery would be made during the early part of next year. This decision to adopt the automatic system for Buenos Ayres would not mean any alteration in the numbers of the present operating staff, as the exchanges in question were entirely new ones; but it should reduce the number of operators necessary for future developments. The Argentine Government had suspended the regulations which since 1912 had seriously retarded telephonic development, and they were now free to proceed with important works which, had it not been for these regulations, would have been completed long ago. Unfortunately, however, the obtaining of the necessary material to-day was very difficult, and this would prevent them from making the rapid progress they desired. These new works, together with the continued expansion of the company's business, would naturally mean a considerable

expenditure, and it would be necessary to provide further capital. Though there was no need to make a new issue of shares forthwith, they were asking for sanction to an increased share capital, so that, probably next year, they would be in a position to make an issue. The increase of capital would be from £2,000,000 to £2,500,000.

Marconi International Marine Communication Co., Ltd.

Mr. Godfrey Isaacs, presiding at the annual meeting, on June 18th, said that the year had been a somewhat difficult one in consequenec of the dismantling of a great many ships following the cessation of war and for other reasons. In regard to the statement that was frequently made that their charges were far too high, the public did not understand that they received only 2d. per word of the 10½d. charged; 6½d. went to the Post Office and 2d. to the shipowners. Last year he told them it was probable that an additional source of revenue to the company would arise from the use of the direction finder on board ships. This apparatus had been further improved, and was now becoming a really valuable device in assisting navigation, and would become a serious factor in the protection of life at sea. It had been installed on a number of ships, and they looked forward to it being largely employed. The speaker referred to the strike of wireless operators and the negotiations that had taken place prior to the strike. He said that the demands would cost the company £500,000 per annum, and they could not be conceded without reference to the shipowners.

Marconi's Wireless Telegraph Co., Ltd.

The report for 1919 shows a credit balance of £1,220,740 plus £463,787 brought forward, making £1,684,526. Dividends of 22 per cent. on the preference shares and 25 per cent. on the ordinary, also a bonus of 5s. per share, without deduction of income tax, on the old ordinary and the preference shares will leave £955,202 to be carried forward. The report says:—"There having been no settlement with any of the Government Departments in respect of any of the company's claims arising out of the war or for services rendered during the war, no sum in respect of any of these claims figures in the year's accounts. In consequence of unfavourable rates of exchange which obtained at the end of the year, considerable sums of money have been allowed to remain abroad on deposit or invested in foreign Government securities. A sum approximating £58,000 has been debited to profit and loss account, calculating the rate of exchange on December 31st as though the money had been brought home at that date and the loss incurred. The loss, however, has not been actually incurred, and when in the course of time exchanges improve, as no doubt they will do, the sums written off will figure in a future balance sheet as a profit. Further, a sum of £56,000 has been written off, representing depreciation in investments in British and foreign Government securities. Meeting: June 29th.

Anglo-Argentine Tramways Co., Ltd.

The gross receipts for 1919 were £3,296,957, less expenditure £2,578,516, leaving £718,441, plus interest, &c., £39,521, and £83,043 brought forward, making £841,005. Deduct: Annuity to City of Buenos Ayres Tramways Co. (1904), Ltd., £70,660; debenture interest and sinking funds, £587,821; sinking fund for redemption of preference and ordinary stocks, £7,014. The balance to net revenue was £175,510. The directors recommend a dividend of 5½ per cent. on the cumulative first preference shares, being the arrears for the year to June 30th, 1918, less income tax. This absorbs £123,200, and leaves £52,309 to be carried forward. Traffic receipts increased 6.52 per cent. This would have been considerably augmented but for the interruption of services caused by strikes. Passengers carried 370,734,985, being 21,448,647 in excess of 1918, an increase equal to 6.14 per cent. The operating expenses show an increase of £198,178, due to extra cost of all materials and higher wages, a special expenditure during the strikes of £35,737, and a further addition of £54,670 to renewals reserve. The abnormal price of fuel continued to act adversely upon the cost of working, but the second half of the year showed a slight improvement. After protracted negotiations and full investigation by the municipality, the justice of the company's claim for a revision of tariffs was recognised, and an ordinance was promulgated authorising an increase from 10 to 12 cents to take effect as from April 10th this year. The directors record their appreciation of the manner in which the negotiations were conducted by Mr. Pedriali. Sir George Touche, Bart., has been elected chairman of the company in place of the late Mr. J. B. Concanon. Baron L. Janssen and Count C. Cicogna, who joined the board in 1908, have retired. The vacancies on the board were filled by the election of Monsieur Mourice Despret, President of the Société Financière de Transports et d'Entreprises Industrielles, Brussels, Sir Philip Lloyd-Greame, K.B.E., M.P., and Major J. E. Dunning, D.S.O. Mr. Joseph Pedriali, the general manager in Buenos Ayres since 1909, has also been elected to the board. Lengthy extracts from the report by the general manager accompany the statement. Among other matters covered therein are the conditions under which the ordinance relating to the increased tariff was adopted. There are to be as from April 10th, minimum wages of $4 and $4.50 respectively for labourers and all employés; an 8-hours' working day; an increase of 10 per cent. on all wages over the minimum; contribution of 8 per cent. on wages by company towards pension funds. The increased tariff is for three years, at the end of which it is to be revised. Any extra profits after allowing 8 per cent. on full capital actually invested, to go to the municipality. 30 km. of new track to be constructed by the company within three years; arbitration to be provided in case of labour disputes. Although the new obligations are very heavy, it is anticipated that the new tariff, combined with greatly increased traffic and decreased expense in cost of electricity, will have a favourable effect upon the finances of the company during the present year. In regard to prospects, Mr. Pedriali says:—

> The year 1919 gave proof of how rapidly this country can recover from a critical situation, when it is aided by good harvests, which are the backbone of all business here. When writing my report for 1918, at this time last year, the outlook was not brilliant owing principally to the very grave state of affairs existing as regards Labour, but the professional agitator was side-tracked, with the result that confidence was gradually re-established. We are at the present moment experiencing increases in receipts that are greater than we have had before. It would be practically impossible for this rate of increase to continue during the entire year, but I have no doubt that we shall continue to have big traffics. The shortage of cars which we are now beginning to experience is responsible to a great extent for the very high earnings per car kilometre run, and this will continue through the year.

Prospectuses.—*Callender's Cable & Construction Co., Ltd.*—The list is to close on or before June 26th (to-morrow) in an issue of 400,000 7½ per cent. "B" cumulative preference shares of £1 each at par, and 100,000 ordinary shares of £1 each at 22s. per share. The proceeds of the issue are required for erecting additional workshops at Erith, providing further working capital to cope with the increased turnover of the company and its subsidiary, the Anchor Cable Co. The report of the annual meeting of the company appears in this issue of the REVIEW.

A. Reyrolle & Co., Ltd.—The list of applications for the 160,000 ordinary shares was closed on Saturday last, the amount being over-subscribed.

Stock Exchange Notices.—The Committee has ordered the undermentioned to be officially quoted:—

Marconi International Marine Communication Co., Ltd.—440 shares of £1 each, fully paid (Nos. 1,192,287 to 1,192,726).

Mather & Platt, Ltd.—450,000 ordinary shares of £1 each, fully paid (Nos. 600,001 to 1,050,000).

Dealings in the undermentioned have been specially allowed by the Committee under Temporary Regulation 4 (3):—

Aster Engineering Co. (1913), Ltd.—100,000 eight per cent. cumulative participating preference shares of £1 each, 5s. paid, Nos. 1 to 100,000.

Keith (James) and Blackman Co., Ltd.—40,000 new ordinary shares of £1 each, fully paid, Nos. 160,001 to 200,000; and 80,000 ordinary shares of £1 each, fully paid, Nos. 80,001 to 160,000.

South Wales Electrical Power Distribution Co.—The report for 1919 states that units sold show an increase of 8,534,082. After payment of all expenses, the credit balance of the past year's working was £25,627, which with £2,670 to the credit of suspense account, makes £28,297. Deducting interest on prior lien debenture stock and original debenture stock, and making provision for depreciation of new plant, there remains a balance of £676 to be carried forward.—*Financial Times.*

Eastern Telegraph Co., Ltd.—Dividend at the rate of 3½ per cent. per annum, less income tax, on the preference stock for the quarter ended June 30th, and a first quarterly interim dividend of 2½ per cent. on the ordinary stock, free of income tax, in respect of profits for the year ending December 31st, 1920.

Electro-Bleach & By-Products, Ltd.—Profit for 1919 £34,637, plus £394 brought forward. Total dividend on the ordinary shares 14 per cent. for the year. £5,000 to reserve; £4,277 carried forward.

Petters, Ltd.—Ordinary share dividend at the rate of 10 per cent. per annum, free of tax, for the year ended March, 1920. To reserve £8,000; written off expenses of issue of additional capital £5,645; carried forward £20,219.

W. & T. Avery, Ltd.—Further dividend of 10 per cent., making 15 per cent. for the year ended March. To reserve, £20,000; carry forward, £23,003.

Waygood-Otis, Ltd.—Dividend 7½ per cent. on the ordinary shares for the year ended March, 1920. Carry forward, £14,446.

Imperial Tramways Co., Ltd.—Dividend on the ordinary shares 4 per cent., less income tax, £5,600; carried forward £966.

Eastern Extension, Australasia & China Telegraph Co., Ltd.—Interim dividend for the three months ended March 31st last of 5s. per share, free of income tax.

British Electric Traction Co., Ltd.—Net profit for year ended March, 1920, £211,316, against £213,324. Dividend 4 per cent. on the ordinary stock. Carried forward £150,422, as against £130,952 brought in.

Direct Spanish Telegraph Co., Ltd.—Dividend on the ordinary 7 per cent. and a bonus of 3 per cent.; to reserve £5,000; carried forward, subject to excess profits duty £20,328.

J. G. White & Co., Ltd.—Dividend on ordinary shares for year ended February, 1920, 7 per cent., less tax. To reserve £30,000; carried forward £15,286.

International Light & Power Co.—Dividend 1¼ per cent., less British income tax, on preference shares for the quarter.

Ransomes, Sims & Jefferies, Ltd.—Dividend on the ordinary shares 5 per cent. per annum; carried forward £36,354.

STOCKS AND SHARES.

TUESDAY EVENING.

WITH the approach of the end of the first half-year, the Stock Exchange does not look for any particular increase in the volume of business, and it cannot be said that the House is disappointed. So far as the money market is concerned, New South Wales has broken fresh ground by offering 6½ per cent. stock at 100. This is the highest rate to be paid by such a borrower for a long time past, and cannot fail to have its effect upon investment securities of all kinds. The industrial markets, however, are fairly well maintained, owing to the lurking hope that the 60 per cent. Excess Profits Duty may not be imposed after all, although, seeing how far away we are from the Budget, the more cautious observers are inclined to think that the 60 per cent. will have to stand in respect of the current financial year, and that it will not be lowered until next April.

Something of a feature is the way in which Edison Swan shares have risen from 23s. 9d. to 26s. 3d. Various rumours are afloat to account for the improvement. Of two authorities who were consulted in regard to the rise, one said that there is an amalgamation scheme in the air, while the second one stoutly denied the existence of any such thing. That well-informed people have been buying is, however, indisputable, and a good deal of interest attaches as to what may be the upshot of the present advance. Other electrical manufacturing shares have hardly moved. General Electrics and Siemens, which are being closely watched, remain at 23s. 6d. (for the new shares) and 26s. respectively. Callenders new issue of preference and ordinary is out, and the ordinary shares are being offered at 22s.—not 24s. as it was originally reported that the issue price would be. The prospectus will certainly appeal to those who are connected with the industry, and in ordinary times when investors are ready to take good stock, there would be no doubt in prophesying a signal success for the issue. Sharp recovery has occurred in Home Railway stocks, in the course of which most of the steam issues have gone up from 10s. to 50s. per cent. Up to the present, however, the Undergrounds have made little advance upon their improvement of a week ago. As before indicated, however, it will require but a little increase in fares for the Underground Electric Railways of London to find all the difference between loss and profit, and, when this aspect becomes more generally recognised, the company's 6 per cent. income bonds will not remain at their present price of 59½ for long.

The American Marconi Company has notified that a further and final extension has been made to June 30th as the last day upon which certificates in the company can be received in New York for exchange into the shares of the Radio Corporation of America. It may be recalled that holders of American Marconi will receive one new ordinary and one new preferred in exchange for one American Marconi share. Moreover, the old certificates will be returned to the proprietor, to be held in case there may be any residue of assets left over in respect of matters at present in suspense. When a market starts in the new shares, it is likely that there will be active dealings in them, but further delay has occurred in obtaining permission to start transactions. The parent shares, after dipping to 3 9/16, recovered to 3 11/16. The new shares and the preference, both at 3½, show little change on the week. Marines remain at 38s. 9d. In the cable market, the Eastern group continues to be somewhat heavy. In reply to a good many inquiries on the subject, it may be as well to point out that there is comparatively little difference, relatively speaking, between the old and the new issues of the four principal companies, though, of course, the new shares, standing at lower-looking prices, appear to be rather more attractive. The Eastern Company has declared its usual quarterly dividend of 2½ per cent., and the Eastern Extension 5s. a share. Globe preference hardened to 8¾. The company's report shows an increase of £36,000, at £264,000, in the net revenue for the year just ended.

The Mexican list is decidedly harder. Advices have been received to the effect that the Mexican Railway Company has been officially handed back to its proprietors. This gave a fillip to all Mexican issues, and most of the Government railway and utility descriptions are substantially better on the week. Business, however, is very quiet, and the improvements are the result more of sentiment than orders. Competent experts in the Stock Exchange declare that the present Mexican administration gives more substantial hopes for settlement of the country than they have seen for several years past, and it is claimed that the present governors are proceeding upon businesslike and sensible lines in the direction of restoring order in Mexico. In the circumstanes, it is not surprising to find Mexican Light and Power first bonds 3½ up at 46, while the seconds have risen to 27½ and the preferred to 21½. Pachuca bonds at 36 are 3 to the good. Mexico Tramway bonds of both classes are 3 higher. Elsewhere, British Columbia preferred and deferred are again noticeably better, there being a good deal of quiet buying of the semi-investment order. Brazilian Tractions have fallen to 47, this being due partly to financial weakness in Paris.

In the electrical supply market, Charing Cross and Kensingtons are both lower, but City of Londons hardened up a little to 24s. 4½d. The British Electric Traction report had no effect upon the price of the stocks. Some people hoped for rather better figures to be shown, but the dividend, as already mentioned, has been raised from 3 per cent. to 4 per cent., and the price of the ordinary is left at 35 middle, the 6 per cent. cumulative participating preference being 62½. The company's 5 per cent. first debenture changed hands on Monday at 67, and the 4½ per cent. second debenture stock is quoted 57½ middle. London United Tramways 4 per cent. debenture stock can be bought at 37. Armament shares are still dull. An issue of short-term notes bearing interest at 6½ per cent. is expected from the Armstrong Company, at par. Several engineering and similar issues have spurted sharply during the past few days. Babcock & Wilcox, however, remain at 2½. Metropolitan-Vickers preference eased off to 2½. Rubber shares are quiet, the steadiness of the raw material being put forward as the reason why the principal shares vary so little in price from day to day. Business throughout the Stock Exchange is far from active, and the tone may best be described as mixed.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1918.	Dividend 1919.	Price June 22, 1920.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	8	12	6½	—	£9 8 9
Charing Cross Ordinary	4	7	9½	— ½	10 0 0
do. do. do 4½ Pref.	4½	4½	32	—	8 3 8
Chelsea	3	4	36	—	8 0 0
City of London	8	10	1 7/8	+ 3/8	8 4 0
do. do. 6 per cent. Pref.	6	6	17/-	—	7 1 3
County of London	7	8	8½	—	9 17 0
do do. 6 per cent. Pref.	6	6	8½	—	7 5 5
Kensington Ordinary	6	7	4	— ½	8 15 0
London Electric	Nil	3½	1½	—	6 0 0
do. do. 6 per cent. Pref.	6	6	8	—	15 0 0
Metropolitan	5	6	9½	—	10 8 8
do. 4½ per cent. Pref.	4½	4½	9½	—	8 0 0
St. James' and Pall Mall	10	12	28	—	8 16 10
South London	6	6	34	—	9 12 0
South Metropolitan Pref.	7	7	18/9	—	7 0 0
Westminster Ordinary	8	10	5	—	10 0 0
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	73½	+1	7 13 10
do. Def.	33/6	1½	18	—	8 6 8
Chile Telephone	5	6	6½	—	*4 12 1
Cuba Sub. Ord.	7	7	9	— ½	*7 15 7
Eastern Extension	8	10	14½	—	*6 18 0
Eastern Tel. Ord.	8	10	147½	—	*6 15 7
Globe Tel. and T. Ord.	5	10	15½	—	*6 7 0
do. do. Pref.	6	8	8½	+ ½	6 17 2
Great Northern Tel.	22	—	214	—	9 15 6
Indo-European	18	10	85	—	7 2 10
Marconi	25	25	3 1/16	+ 1/16	8 15 6
Oriental Telephone Ord.	10	12	9 1/16	—	*4 18 4
United R. Plate Tel.	6	6	7½	— ½	*6 11 4
West India and Panama	1/8	Nil	1/16	—	Nil
Western Telegraph	8	10	12½	—	*6 9 0
HOME RAILS.					
Central London Ord. Assented	4	4	44½	—	8 19 9
Metropolitan	1	1½	20	+ ½	6 5 0
do. District	Nil	Nil	15	—	Nil
Underground Electric Ordinary	Nil	Nil	1/16	—	Nil
do. do. "A"	Nil	Nil	4/6	—	Nil
do. do. Income	5	4	59½	—	6 14 6
FOREIGN TRAMS, &c.					
Anglo-Arg. Trams. First Pref.	Nil	5½	32	—	8 3 0
do. do. 2nd Pref.	Nil	Nil	8½	—	—
do. do. 5 Deb.	5	5	60	—	8 6 8
Brazil Tractions	Nil	—	47	—2	—
Bombay Electric Pref.	6	6	13	—	4 10 8
British Columbia Elec. Rly. Ptce.	5	5	57½	—	8 13 10
do. do. Preferred	2½	5	53½	+3	9 7 0
do. do. Deferred	Nil	3	53½	+3	5 14 3
do. do. Deb.	4½	4½	53½	—	8 2 0
Mexico Trams 5 per cent. Bonds	Nil	Nil	31½	+3	Nil
do. 6 per cent. Bonds	Nil	Nil	25½	+3	Nil
Mexican Light Common	Nil	Nil	12½	—	Nil
do. Pref.	Nil	Nil	21½	+2	Nil
do. 1st Bonds	Nil	Nil	46	+3½	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	2½xd	—	*5 14 4
British Aluminium Ord.	10	10	1 3/16	—	9 8 9
British Insulated Ord.	12½	15	1½	—	8 2 8
Callenders	25	15	1 3/16	—	9 12 0
6½ Pref.	6½	6½	18/9	—	6 18 6
Castner-Kellner	20	17	3½xd	—	5 4 7
Crompton Ord.	10	—	22/-	—	9 1 10
Edison-Swan, "A"	10	—	1 1/16	+ ½	7 13 4
do. do. 5 per cent. Deb.	5	5	79½	—	6 6 9
Electric Construction	10	—	21/-	—	9 10 6
Gen. Elec. Pref.	6½	6½	18/6	—	7 0 5
do. Ord.	10	—	32/6	—	*6 8 0
Henley	25	15	1½	—	8 0 0
do. 4½ Pref.	4½	4½	8½	—	6 18 6
India-Rubber	10	—	13½	—	*7 11 0
Met.-Vickers Pref.	—	8	2½	— 1/16	7 2 3
Siemens Ord.	10	10	26/-	—	*7 13 10
Telegraph Con.	18	20	21½	—	*5 11

* Dividends paid free of Income Tax.

POWER FACTOR FROM THE BUSINESS MAN'S POINT OF VIEW.

[Some comments from a correspondent.]

A simple explanation of a subject may contain incomplete statements, but it ought not to include any that are misleading or open to question with regard to their correctness. There are so many parts of Mr. Turnbull's article on Power Factor in the Electrical Review for June 4th, 1920, that seem to be both incorrect and misleading that some comment on them is necessary. Supply companies are indeed desirous of charging for the units they deliver on a sliding scale based on power factor, but surely the difficulty is rather the lack of a meter which will register adequately according to such a scale than the impossibility of making the consumer pay for something he does not understand. We all pay for things that we neither understand nor ever think of trying to understand; we are doing so now for services alleged to be rendered in connection with cheese and coal and clothes and many other things beginning with "c," besides several that do not begin with "c." Why is wattless current any more "elusive" than any other sort of current? And does any consumer actually "understand" what he is paying for, even in the simplest case? If wattless current is explained so that it is "elusive," it is not necessarily the fault of the consumer or of the current.

For wattless current, in spite of what Mr. Turnbull suggests, has a useful function. The analogy of the bank is almost altogether fallacious. The £30 that is bandied about is of no use either to the bank or to the customer, but the "oscillating current," to use Mr. Turnbull's good and illuminating phrase, is of so much use to the motor that it would not be a motor at all without it. It is, in fact, its magnetising current, and is, therefore, absolutely essential to its working. So it is not correct to write of a motor drawing more current from the mains than it requires. It draws all the time just what it needs, neither more nor less. It is perfectly true that, other things being equal, an alternating current motor will take more current from the mains, the lower its power factor is, but the whole problem is one of compromise, and is solved by answering the question whether it is cheaper to put copper in the mains and elsewhere to accommodate the larger current, or to provide a more expensive motor which will work with less current? And the fact that induction motors without power factor correction are so largely used seems to show that that is, on the whole, the cheapest practice in the case of alternating current supply. But if certain consumers are utilising an undue share of the mains and plant by having motors with an abnormally low power factor, they should be asked to pay something towards the cost of the plant that they use more than their neighbours. Even then, it may be cheaper for them to do so than to improve their power factor.

There is apparently some confusion between horse power and current in parts of the article. An "ordinary measuring instrument," presumably an ammeter, would show a greater current than would be taken at unity power factor, but what "ordinary measuring instrument" will show a consumption of 130 h.p. in a circuit using only 100 h.p.? If it does, its place is in the repair shop or on the scrap heap. An indicator diagram taken from the engine driving the generator would not show it, except that a little extra power is used to supply the losses due to the additional current. The article describes a motor which takes 130 h.p. from the mains, and returns 30 h.p. to the mains as an "oscillating power." But it is not correct to say that the motor takes 130 h.p.; its continuous demand from the mains is for just enough power to keep it doing its required work. The reference is, no doubt, to a motor which, if it had a 100 per cent. power factor, would take a certain current, say, 100 amperes, but actually takes 130 amperes, because its power factor is less than 100 per cent. Mr. Turnbull seems to suggest at several points that 30 amperes is the value of the "oscillating current" in such a case; it is, however, really 83.1 amperes.

It is perfectly true that means can be used to prevent the "oscillating currents" in the supply mains; but "oscillating currents" must be provided somewhere, to act as magnetising currents, and if they are not in the supply mains they must be elsewhere. Here is the crux of the whole matter: Mr. Turnbull says that while these correcting devices "cost money, they bring about a great saving in the cost of supply, which is naturally beneficial to users of electric motors." But no: it is not "naturally" beneficial. It is beneficial only if the cost of the improvement is less than the cost of doing without it. Had these correcting devices been as cheap as Mr. Turnbull suggests, would not supply companies have provided them to counteract the baleful effects of these horrid motors? And is there not at least a case for examination, in view of the fact that the supply companies have not made a general provision of them, whether the additional plant and mains that are required to supply current to "imperfect" motors are not cheaper than smaller plant and "perfect" motors? Of course, if the consumer is going to pay for the improvement the supply company will no doubt be able to make a joyful noise and say, "Behold the cheapness of our power!" But if I were to say to Mr. Turnbull, "Here is some excellent coffee. It costs but one penny a pound, but you will never taste coffee as good as this anywhere except here. Only, you must provide a solid gold cup to drink it from, as otherwise it will poison you." I believe Mr. Turnbull, being human, would prefer the old-fashioned coffee in the old-fashioned cup, and think it good enough; and he would be right. So let him tell the business man the whole story, lest the business man some day, with foaming mouth, turn and rend him, and his last state be worse than his first.

Even if a system had a 50 per cent. power factor, the cost of plant would not be doubled on account of the doubled current. The prime mover would be practically the same size, and an alternator does not double its price when its k.v.a. output is doubled; the estimate is, therefore, hopelessly fallacious. It is unfortunate to use the word "efficient" as it is used at the end of the article, because "efficiency" in connection with a motor has a special technical meaning that is wholly apart from the idea of power factor. But, even admitting that the "efficient" motor results in cheap energy, I do not want cheap energy unless I can use it cheaply; and I do not find any help in the article towards a decision as to the total cost to me of the energy I am going to use. In fact, I think Mr. Turnbull's method would leave the consumer in as dense a fog, though possibly a different kind of fog, as any of the alternative technical explanations he rejects as useless.

And now, as fools rush in where angels fear to tread, I have my own suggestion to make. Were I the business man, without expert knowledge, to whom Mr. Turnbull was explaining things, I should be very content if he just said this to me: "It pays us, as a supply company, to use what is known as alternating current. Motors which use this current demand rather a large amount of it, but the current they take really represents less power than it would do if it were put into certain other kinds of apparatus, and the amount required by your motor of 100 h.p. on our system depends on the design of the motor. If we put in an ordinary meter, that meter will register, and you will pay for, just the power you actually use, and the amount of your bill will be practically the same, therefore, however your motor be designed in respect of its demand for additional current, so long as we decide to charge you

exactly on the indication of your meter. I can prove this to you experimentally, if you doubt it, but I am sure you will take my word for it as an expert. Only remember this: Although the meter will register according to the real power you take, and not according to the additional current I have told you of, we have to provide means to carry the additional current, and so we have to lay out more capital, and you, as a business man, know what that implies; we must have more revenue because of it. Now, the motor that demands less additional current is more expensive to buy than the motor that demands more; if, therefore, you like to put in the more expensive motor, and so really allow us to increase the capacity of our plant without increasing its size, we shall ask you to pay us less per unit than your neighbour, whose motor requires more current for the same power, even though his meter registers the same as yours, because he has used more of our plant in doing the same work. The total cost to you, allowing for the interest on your additional outlay, will be about the same, but you will be helping us, and I am sure you will be glad to do that." Then I, as a plain business man, should say to Mr. Turnbull: "You, too, are evidently a business man, and I understand clearly what you have told me. I am perfectly willing to help you, especially if it is going to cost me nothing." So I should get from him his tariffs, and ask the manufacturers for comparative prices for different designs of motors, on the lines of Mr. Turnbull's explanation; and I should strike a nice balance between debit and credit, and might even feel the richer because of the glow of satisfaction within my bosom that at last this matter was clear to me. So we should all be happy; and blessed above all men would be Mr. Turnbull, who had shed light on my darkness, and yet had never once mentioned power factor in all that he had said.

FRENCH RAILWAY ELECTRIFICATION.

The French Minister of Public Works formed in November, 1918, in accordance with the upper chamber of Public Works, a committee to examine the propositions submitted by the railway systems of the Paris-Lyons-Mediterranean, the Orleans, and the Midi for the electrification of about 10,000 km. of the lines of their systems. The committee sent a commission of Government and railway engineer specialists to the U.S.A. in order to study American practice. Apart from the general duty of the Mission, consisting of collecting documents on railway electrification and the distribution of electricity at high pressure, its principal duty was to find out, on summing up all the information gained by study of the Swiss and Italian electric railways on one side and the American on the other, if a system of electric traction existed for large railways distinctly superior to all others, and able to be adopted to the exclusion of all others by all the different companies interested for the projected electrification in the centre and South of France.

From the four systems in operation, *i.e.*, single-phase, 3-phase, single-to-3-phase, and H.T., D.C., the 3-phase had already been studied in Italy, where it is largely used, but not to any appreciable extent elsewhere. The single-phase had been equally studied in operation in France on the Midi railway and in Switzerland on the Loetchberg lines, and in construction on the Swiss Federal Railways, which have adopted this system for the gradual electrification of all their systems, and in course of construction, for the Gothard railway. The single-to-3-phase and the H.T., D.C. systems are used mostly in the U.S.A., and so became the principal object of the Mission's work. At the same time the examination of American single-phase installations (25-cycle, while the analogous French installations are 16-cycle) completed the study of monophase installation.

Information gathered in the U.S.A. forms the subject of a detailed report by M. Manduit, secretary of the Mission, and Professor of the Faculty of Science of the University of Nancy, France, of which a translated summary from the *Journal Official de la Republique Francais*, August 13th, 1919, is given in the *General Electric Review*. Briefly, the chief points set out are as under:—

The principal lines equipped with monophase current in America are suburban lines, but the system is applicable to larger lines, and is the same as that of the French Midi, save that the frequency is 25 instead of 16 cycles. The American monophase installations, especially on account of the high frequency adopted, and the employment of motors often not so good as those found on the Midi and in Switzerland, showed an installation less perfect than similar ones in Europe. At the same time the struggle against interference with telephone and telegraph lines has been carried to considerable perfection; also the trolley lines with catenary suspension are remarkably well made. The assembled experience of France, Switzerland, and America points to the conclusion that the monophase system is still far from presenting the solution to a number of problems insufficiently solved in actual practice, notably the production of a motor capable of exerting a heavy torque for a considerable time without rotating in order to be able to start heavy trains on important grades, and of regenerative braking. Furthermore, the system leads to complicated equipment for the protection of neighbouring telephone circuits, which considerably augments the cost of installation. Without this consideration the cost would be distinctly less than similar costs with the 3-phase and H.T., D.C. systems. The expenses of maintenance of the rolling stock are always higher than in the latter two systems, and the motors are less rugged and capable of less overload.

The single-to-3-phase, or split-phase, system is only employed on one line, namely, from Bluefield to Vivian on the Norfolk and Western Railway in the Appalachian mountains in Virginia, U.S.A., for a length of 48 km., with two or three tracks, and numerous curves and grades reaching 20 mm. per metre. The locomotives are flexible and robust, but their operation brings out mechanical and electrical faults which have not been corrected up to the present in an adequate fashion, and on account of which the installation may be considered to be as yet only in the test period. The maintenance expense of the rolling stock is greater than that of other systems. The system, which on first sight appears very interesting, has not yet fulfilled the hopes that were held out at the commencement.

The greater part of the inter-urban lines in the U.S.A. operate at 1,200 volts D.C. with an overhead trolley wire, and many of them are really railways with both passenger and freight traffic, and speeds of 60 to 80 km. P.H. are attained. The equipment for this voltage is now as standard as that for tramways. Equal success has attended the use of 2,400 and 3,000 volts. All members of the Commission were unanimous in considering that the Chicago, Milwaukee, and St. Paul electrification, by far the most important in the world, was at the same time greatly superior to all others on account of the excellence of its technical operation from all points of view.

Three-phase power at 100,000 volts is converted by motor-generators, each of which consists of a synchronous motor and two D.C. generators mounted on the same shaft and coupled electrically in series in such a manner that each produces only 1,500 volts at the commutator. The sub-stations are the most delicate and the most costly part of this traction system, but they only number 14, about one to every 50 km., and they operate excellently, requiring only three men each for continuous operation with capacities of from 4,000 to 6,000 KW. By the use of flash barriers on the commutators and of high-speed circuit breakers in the main line accidents resulting from flash overs have been eliminated. The excellence of the installation of these sub-stations accounts for a good deal of the success obtained by the H.T., D.C. project.

At the relatively low pressure of 3,000 volts on the trolley wire experience shows that with a double trolley wire and a pantograph trolley with a double shoe and quadruple contact a current of 2,000 amperes is easily obtainable at a speed of 80 to 95 km. P.H., and 4,000 amps. at 25 km. P.H., which is more than sufficient for the heaviest trains and the highest powers. The locomotives are very easy to run and operate perfectly, the series D.C. motors being the ideal type for traction purposes. They are capable of regenerative braking, marvellously regulated, which assures the most flexible progress on down grades and occasions an important economy of power, wheel tires, and brake shoes. A single armature winder with an assistant assures the operation of the 336 motors of the 42 locomotives in the service. A single locomotive is sufficient to haul passenger trains of 1,000 American tons, even on grades of 20 mm. per metre. Freight trains of 2,800 American tons are hauled by a single locomotive on grades of 10 mm., the tractive effort being then 32.8 metric tons. In trains hauled by two locomotives, the second machine is placed in the middle of the train and not at the end; in America all freight trains, like the passenger trains, are provided with an automatic air brake on every car. A considerable advantage of the D.C. system is that the interference with telegraph and telephone lines is insignificant. In spite of the losses due to conversion from 3-phase to D.C., the efficiency of the system is good; 27 watt-hours per metric ton km., which corresponds to an over-all efficiency of 50 per cent. from the point of purchase from the producer up to the point of consumption.

With regard to the conclusions come to relative to the choice of an electric traction system, the writer of the report, on account of the remarkable results in America with 3,000-volt D.C., "does not hesitate to formally conclude in favour of the adoption of this system," and he believes it to be "actually the only system suitable for the electrification of heavy traction lines." The D.C. system presents the inconvenience of being a little more expensive in first cost, on account of the rotary sub-stations required, but this is balanced by the fact that frequency changers would have to be employed if the single-phase system were adopted in France.

So far as the expense of operation is concerned, the difference would not be great, and would not come into consideration in the choice of the system.

It is possible that with the single-phase system, which at the first glance shows the advantage of lending itself to a large variety of combinations, satisfactory operation may some day be obtained, but it is, without a doubt, a fact that the actual practice is far from being desirable at the present time.

Despite certain advantages obtained in Italy with the 3-phase system, it is the opinion of the Mission that it should be rejected, especially in consequence of the complexity and of the high price of installation and maintenance of the two trolley wires.

WATER POWERS OF BRITISH COLUMBIA.*

THIS is one of the most remarkable of the series of official publications yet issued by the Canadian Commission of Conservation, a series which deserves to be more widely known than is at present the case. It is now just over ten years since the Commission commenced its investigation of the character and extent of the various natural resources of Canada. A preliminary report in 1911 merely made evident the paucity of information concerning the water power resources of Manitoba, Saskatchewan, Alberta, and British Columbia. The deficiency so far as concerned the first-named three provinces was made good by a report published in 1916, and the present volume (which completes the programme undertaken in 1910) is a compendium of data relating to the water power resources of British Columbia. The physical difficulties of investigating streams in this province are immense, and the season available for useful reconnaissance is very short, since the work has to be performed when the streams are neither approaching nor at their floor. The greater credit is consequently due to the engineers responsible for collecting the data presented.

The opening chapters comprise a statement of guiding principles which should govern the conservation and utilisation of water power, and a description of the more important features which should characterise reliable water power data. This information is of quite general applicability, and experience has shown that loss of time and waste of effort have resulted from ignorance or imperfect knowledge of these fundamentals. The abnormal price and short supplies of coal during recent years have aroused widespread interest in water-power possibilities. In so far as the latter are technically and commercially sound propositions, this awakening of interest is all to the good, but the idea is still too prevalent that wherever there is running water there is boundless energy to be had at next to no cost. Mistakes of this nature are by no means confined to the general public; for instance, during ten or twelve years preceding 1915, eighteen large hydroelectric plant in the U.S.A.—totalling over 600,000 developed horse-power, and involving about $125,000,000 investment—proved financially unprofitable. It is stated that most of these failures have resulted from mistakes of engineers, especially in estimating the quantity of water available (the errors ranging from 30 to 200 per cent.), and in estimating the cost of development (some of the projects costing nearly twice the sum estimated). The possibilities of power development from coal must always be considered, both as regards direct competition with hydroelectric energy and as a means of supplementing the latter during periods of low water.

Naturally it is the low water flow which determines the maximum output which can be supplied continuously by a water-power station. Estimates should be based on records extending backwards for as many years as possible, and the normal ratio of flood to minimum flow must be determined. Owing to the vast natural storage capacity of the Great Lakes, the St. Lawrence river has a more uniform flow than any other large river in North America or probably in the world, the ratio of flood to minimum flow being only 2 to 1. On the Winnipeg river, above English river, the ratio is about 6 to 1; on the Ottawa river and on the Pend d'Oreille river (B.C.) it exceeds 15 to 1; on the Delaware river at Port Jervis (N.J.), it is 375 to 1; and there are, of course, many streams draining quite large watersheds which dry up during the summer. The importance of studying records relating to as long a period as possible is illustrated by the fact that the ratio of flood to minimum flow in the Columbia river at Dalles (Oregon) was 28 to 1 average for 37 years, and only 15 to 1 during the five-year period ending 1915. Obviously it would be easy to make serious mistakes even by the conservative application of data collected during a period of five years. Similarly a single century-old instance of backflooding may condemn a proposal to dam a stream. Another point which is emphasised in the present report is the importance of making the preliminary installation of dams and other main works with regard to the possible future development of more power than is at first required. Often a partial development unwisely planned has made subsequent full-development impossible save at prohibitive cost. The data and explanations given in this report make it easy for the engineer, and even for the non-technical financier, to determine how much useful information there is available concerning a proposed development, and to check the fundamental figures of flow, head, and storage on which depends the possible success of the scheme. Reliance should be placed only upon actual measurements, and great caution is needed if meteorological records are not available for a period of at least ten or fifteen years.

The voluminous data concerning the principal streams of British Columbia are, naturally, quite unsuitable for treatment in abstract. The province is divided into five main divisions, viz., t heColumbia river and its tributaries; the Fraser river and its tributaries; Vancouver island; the mainland Pacific Coast north of the Fraser (including the Skeena, Nass, and Stikine); and tributaries of the Mackenzie river. For each river and its chief tributaries, tables are presented specifying the watershed, head, and probable horse-power, and giving notes concerning the character of the ground and the probable method of development. In addition, there is a large number of tables of meteorological and hydrometric data and others referring to publications of all sorts bearing on water-power development in this district. In round figures there is from 2 to 3 million 24-hour horse-power available in the province, but this total must be considered in relation to a great number of factors and conditions which are enumerated in the report.

Needless to say, the report is absolutely indispensable to anyone concerned with hydroelectric projects in British Columbia and with the related subjects of domestic and municipal supply, agriculture and irrigation, navigation, fisheries and riparian rights. The report has also a wider function in that its preliminary chapters deal so admirably with general questions of water power legislation and policy, with the importance of maintaining the balance of Nature, and with the fundamental distinctions between water and water power. No pains have been spared to prevent the inexperienced or the unscrupulous promoter from foisting upon the public, projects which are commercially or both technically and commercially unsound. Whilst there are enormous quantities of water power still undeveloped in various parts of the world, it is also a fact that a large percentage of this power cannot be developed economically under conditions existent now, or likely to be existent, within the next century or so. It is desirable that water power be developed fully wherever this is economically possible, but, on the other hand, it must be remembered that "most of the best sites are already developed or held by various interests for future development," and that the residual power available for development with undoubted profit is strictly limited. Water-power rights should, therefore, be granted with circumspection and under proper safeguards. The dissemination of generalities concerning enormous amounts of potential water power is too often part of a plan to make easy the acquisition, by interested parties, of the most coveted privileges.

* "Water Powers of British Columbia." By A. V. White and C. J. Vick. 644 pp, 46 plates, 3 maps. Commission of Conservation, Ottawa, Canada. (1919.)

HYDROELECTRIC POWER TRANSMISSION FROM SWITZERLAND TO FRANCE.

IN the *Revue Générale de l'Electricité* for May 1st an account is given of a scheme which was carried out in 1918-19 to enable the Compagnie Lorraine d'Electricité to receive a supply of energy from the power station of the Société Motor de Baden, at Goesgen, on the river Aar. The distance is 185 km. (115 miles), and the pressure adopted was 110,000 volts, though provisionally the service is being carried on at 70,000 volts. The project was formulated under the pressure of war requirements at the beginning of 1918, by the Compagnie Générale d'Electricité, at the request of the Ministry of Munitions, and took the place of a previous scheme which had become unrealisable owing to the war; the frontier was to be crossed at Delle, near Belfort. The French and Swiss constructors were helped in obtaining the necessary material by the Motive Power Department of the Ministry, which enabled them to secure uniformity and quick delivery. The work was begun in July, 1918, and was completed in one year, the line being put into use on August 10th, 1919. The power to be transmitted was 20,000 H.P., necessitating a pressure of 110,000 volts, in order that with a power factor of 0.8 at Pouxeux, the transformer station of the Lorraine Co., the ohmic losses on the 185-km. line should not exceed 10 per cent., or the pressure drop 15 per cent., and the line was built for that pressure; but in order to supply the 70,000-volt network of the company without delay, the latter voltage was adopted for the time being.

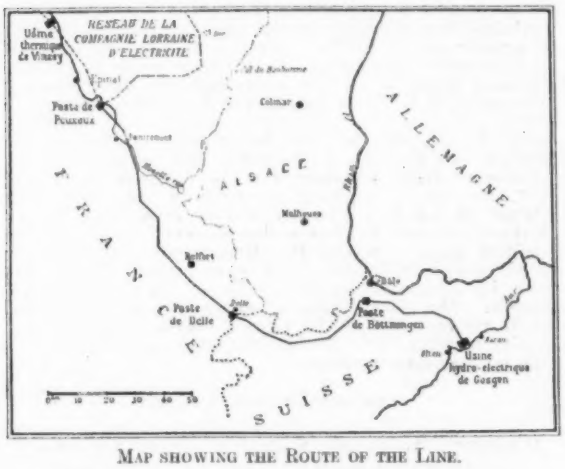
The power station employs a fall of 17 m. (56 ft.) and a flow of 350 m.³ (12,360 cu. ft.) per second; it contains six sets of 7,600 H.P. each, out of eight provided for, and generates at 8,000 volts, 3-phase, 50 cycles per sec.

The line traverses mountainous and wooded districts, with about half its length in each country; at the frontier post at Delle the energy is metered. The highest point reached by the line is at Belfahy, in France, 825 m. (2,700 ft.) above sea-level, but it attains nearly the same elevation in Switzer-

land. It is carried on steel towers, and consists of three copper cables of 78 mm.² (0.12 sq. in.) cross section, supported by suspension insulators. A steel cable of 40 mm.² (0.062 sq. in.) cross section is suspended above the line and earthed at the masts. On the ground that the insulators are the weak points of a high-pressure line (45 per cent. of line faults are due to them) long spans were adopted, the most economical being found to be 180 to 200 m. (600 to 650 ft.); in some cases it was necessary to use a span of 300 m. (1,000 ft.), and on the Swiss side even upwards of 500 m. (1,600 ft.).

Two types of towers were used, one for straight runs and the other for anchoring and angles. The former has a safety factor of over 3, but at road crossings the span is shortened to give a factor of safety of 5; the weight of this tower is 1,300 kg. (2,866 lb.). The anchor tower weighs 2,500 kg. (5,512 lb.), and in both cases the tower is constructed in three sections bolted together. The height of the towers is 19.7 m. (64.6 ft.), and the lowest conductor is slung at 14 m. (46 ft.), so as to give a clearance of about 7 m. between the lowest point of the span and the ground. All the towers are fixed into concrete foundations. The conductors are suspended at the corners of a triangle measuring 3.25 m. (10.7 ft.) vertically, and 4.5 to 4.75 m. (15 to 15.6 ft.) on the other sides. To avoid possible contact between the cables, the supports of the two on the same side are staggered 500 mm. (20 in.). Each tower is provided with a copper earth-plate 400 by 300 by 2.5 mm. (16 by 12 by 0.1 in.). At railway crossings the cables are supported inside a rectangular lattice frame, with double chains of insulators.

Each chain consists of eight porcelain disk elements as a rule, but a ninth is added at anchor or angle towers; each disk is 250 mm. (9.84 in.) in diameter and weighs 3.6 kg. (8 lb.). The complete chain is 1.3 m. (4.26 ft.) in length. The breaking strain is 4.200 kg. (9,260 lb.), and brush discharge commences (over one element) at 50 KV.; sparking-over



MAP SHOWING THE ROUTE OF THE LINE.

takes place dry at 70 KV., wet at 47 KV., and piercing under oil at 90 KV. With six elements, wet, sparking-over commences at 173 KV., and a complete chain of eight elements withstands over 350 KV. dry.

The copper cables have a resistivity of 1.78 microhms per cm. at 20 deg. C., and a breaking-stress of 36 kg./mm.² (51,000 lb. per sq. in.). The working stress does not exceed 8 kg./mm.² (11,400 lb. per sq. in.). The Schlick coupling sleeve is used for joints.

Anchor towers are provided at intervals of 1,000 to 1,200 m. Clearance avenues have been cut through the woods, so that a tree cannot fall on the line.

The line on French territory required 850 tons of steel in 542 towers, &c., of which 434 were of the straight-run type; 200 tons of copper, 29 tons of steel cable, 19,000 insulator elements, and 1,200 tons of cement. In the early stages the line was built by the labour of Kabyles and Moroccans, until demobilisation took place.

Sectioning stations are provided at four points, dividing the line into sections of about 20 km. (12 miles). At the receiving station, Pouxeux, electrolytic lightning arresters are installed in the open air. At the connecting station, at Delle, provision is made for putting in parallel the water-power station at Goesgen and the steam-power station of the Lorraine Co. at Vincey, for breaking the circuit, and for measuring the energy transmitted. The lines first pass through reactance coils combined with horn arresters, with three spark gaps, and a resistance of 10,000 ohms per phase. These are mounted on an external terminal derrick. Inside the station, on the upper floor are reactance coils, isolating switches and cut-outs for the instrument transformers. On the ground floor are the circuit-breakers, and instrument transformers.

Telephonic communication is provided at all terminal and sectionising stations.

It is interesting to note that parallel running between the steam station at Vincey and the plant at Goesgen, 230 km. apart, is effected without any difficulty.

AUTOMATIC TRAIN CONTROL.

AN initial installation of automatic train control has recently been completed on the main line of the C.R.I. & P. Railway between Blue Island and Joliet, Ill., U.S.A., 21 miles of double track in dense passenger and freight traffic territory. The apparatus was designed and manufactured by the Regan Safety Devices Co. (Inc.), of New York and Chicago.

According to the *Railway Review*, the control system consists of two elements; the locomotive and tender equipment includes a shoe mechanism, speed controller, electro-pneumatic valve, relay, battery, and release switch. The roadside apparatus consists of a ramp located by the side of the track, battery, and relay, connecting the existing signal system.

The system embraces automatic speed control, as well as automatic stop features. It is of the intermittent electrical contact type, but arranged to carry continuous speed control through caution territory. In other words, having been actuated to provide speed control, it operates to restrict the speed of the train to a predetermined rate until conditions again necessitate unlimited speed or the train to stop, as the case may be, depending upon the position of the next signal. The speed controller is rigidly bolted to the end of the axle of the pony truck wheels and is contained in a dust-proof housing. It consists of a centrifugal governor arranged to open and close a circuit at any predetermined speed, which is set depending upon the class of traffic to which the locomotive is assigned. Connection is made to the controlling circuit through a stationary junction box to which is connected a flexible conduit; a ball bearing is provided to reduce friction to a practicable degree and to permit free movement of the condulet.

The electro-pneumatic valve, located at a point convenient for connection to the air brake system, operates in response to an electro magnet, and controls the brake pipe pressure and the reservoir supply to the engineman's brake valve. When the magnet is de-energised, the valve reduces the brake pipe pressure to ensure a service application of the brakes; at the same time it restricts the reservoir supply, so that the brakes cannot be released by the engineman's brake valve. The brake pipe pressure may, however, be still further reduced by the engineman in the same manner as with the conductor's emergency valve.

The shoe mechanism consists of a stem, a circuit controller and a cylinder housed in a substantial steel case which is rigidly bolted to the arch bar of the tender truck or to the trailer truck of the locomotive, as the case may be. The shoe is held in position and in contact while moving over a ramp by means of brake pipe pressure in the stem cylinder, to which the brake pipe is connected. The stem is cored, so that should it be broken, a service application of the brakes would result. The shoe circuit controller operates to substitute, in a normally closed circuit, energy from the roadside battery for that from the storage battery carried on the locomotive, also to transmit current of the proper characteristic from the roadside battery to actuate the locomotive apparatus and control the train consistent with the indication displayed by the block signal.

The storage battery is of the portable lead type and consists of five cells of 80 ampere-hours capacity, operating through resistance.

The relay is of a 3-position type connected into the circuit so as to repeat the position of the signal by means of electric currents of the several characteristics as may be transmitted by the roadside and locomotive apparatus.

The ramp is made up of angle iron, with a copper insert, suitably mounted upon cast iron supports which are rigidly bolted to the standard cross ties, a wood block separating the ramp iron from the support castings. This ramp is patented and very different from any ramp used elsewhere. It is 120 ft. long, and is located approximately 160 ft. in front of each signal. The ramp and the track are so connected with the signal system as to cause the signal to assume the stop position in case, for any reason, the ramp circuit is de-energised.

The signal system with which this train control system is operated is of the 3-position, D.C., upper quadrant, bottom-post mechanism, semaphore type operated by polarised line circuits. The relays and terminals for the ramp circuits are housed in the signal case or in a special relay box bolted thereto. Connection from the mechanism to the ramp is made through conduits.

In the operation of this system an application of the brakes is made by the automatic control apparatus when any of the following conditions exist: (*a*) When a train passes a signal in the caution position at an excessive speed. (*b*) Whenever a train exceeds a predetermined speed while running in a caution block. (*c*) At a stop signal, or when a block is occupied.

When an application of the brakes is made by the automatic control apparatus, release may be made with the system in service only:—

1. By automatic release, as in caution block territory, when the speed is below a predetermined point.

2. By automatic release, as when passing from caution block territory to a clear block.

3. By the engineman operating the release switch to pass a stop signal.

In the third case the train may then proceed, but only under automatic speed control, until the next block signal is encountered, when, if the block be clear, unlimited speed will be automatically restored.

No part of the automatic train control system is located in the engine cab, its operation being entirely independent of the engineman. It does not in any way interfere with the control or operation of the train by the enginemen so long as he obeys signal indications. It is intended to operate if, for any reason, the engineman fails.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Glory of the Day's Work.

Will you kindly allow me to say how very much I appreciate the article by "Femina" in your issue of June 11th, 1920, on "The Glory of the Day's Work."

If the sentiments therein expressed were firmly implanted in the hearts of everyone taking any part in the industrial life of our nation, and if one and all could realise the value of a day's work conscientiously accomplished, both to themselves and the community at large, most of our labour troubles would vanish, and a spirit of contentment with "our daily round and common task," would prevail.

I consider the article to be of great value in view of the present unrest prevailing.

Jay Gee.

June 16th, 1920.

The Electro-deposition of Iron.

My attention has been called to the article on the electro-deposition of iron appearing in your paper.

I should like to point out that the process originated in my works here. Some undersized gauges for tail shafts for the Admiralty were built up here, with very satisfactory results. This was communicated to the Air Board, with the result that a number of officials visited my works at Sunbury, and the process was taken up by them and developed for a variety of purposes during the war.

Sherard Cowper-Coles.

Sunbury-on-Thames.
June 9th, 1920.

Single-phase Meters on Three-phase, Three-wire Systems.

With reference to the article in the Review of June 11th re "Single-phase Meters on Three-phase, Three-wire Systems," Mr. Solomon states a fact which ought to be well known to all qualified engineers who have to deal with measurement of A.C. power. He points out that the proper method is to use two single-phase meters connected on the two-wattmeter principle, or a three-phase two-element meter. He omits to mention the fact that three-phase power in a balanced three-phase three-wire circuit can be measured by creating an artificial neutral point by means of a star resistance and the use of a single-phase meter having a constant of 3.

If E is the star voltage and I the current in the corresponding meter element, the single-phase meter will read $EI \cos \phi$.

The total power will be $3\ EI \cos \phi$.

Hence if the meter is geared so that the dial reads three times the power actually measured, the total three-phase power will be registered.

J. Henderson.

Glasgow.
June 15th, 1920.

A Technical University.

Your editorial comment on the recent meeting for the formation of a technical university in London calls for some reply.

I will say little with reference to your views on the meaning and function of a university, except that these views are slowly dying out, but the point that I do wish to raise is in what manner the University of London fulfils your ideal. Where in this University "itself" is "*the polish which is imparted by constant association with one's fellows in the atmosphere inherent to a university*"? It may be found in some of the recognised schools of which the Imperial College is one group.

The degrees of London have been maintained at the highest standard, and are everywhere accepted as second to none, yet however highly one values the London degree, one cannot but remember that it may only represent a series of examinations without the solid background of a college training. In my early days, we at the Royal College of Science were taught, I think wrongly, to undervalue these diplomas, and some of us only regarded the University as a store for serving out degrees.

The present need is to provide a technical degree on a par with the bachelor, master, and doctor's degrees of the ordinary universities and known by these names and abbreviations, so that the ordinary commercial man and the man about town can understand something of the training of the holder without having to carefully obtain information of the relative merits of the A.R.C.Sc., A.K.C., B.Sc., &c. In provincial centres, as far as I know, the modern universities fulfil the needs of the times, but in London the case is wholly different, for here we have a large group of colleges combined for the purpose of technical education, more powerful than the University, and yet without the special privileges of a university.

Now, sir, having shown that the University of London (*fait accompli*) does not fulfil your own ideals as a university, I hope you will give the Imperial College of Science your influential support in its claim for a charter.

F. Peake Sexton.

Westminster.
June 15th, 1920.

[We refer to this subject in our leading columns.—Eds. Elec. Rev.]

What is the Contractor Doing?

I have read with great interest the article which, under the above heading, appeared in your issue of June 4th, and from many years' experience can fully endorse the remarks of your contributor.

"Electra," in his reply last week, agrees that there is every prospect of a great boom in electric cooking, but prefers to wait until the manufacturer has created the demand before doing anything himself to foster it.

This sums up the situation exactly, both are waiting for each other, with the result that much profitable business is lost. Have neither of them heard of "Co-operation"?

If this can be accomplished there will then be no need for further articles like the above, and I venture to suggest that their various associations could do much good by putting this subject on their agenda for discussion.

In the meantime the manufacturer can greatly help matters forward by providing the contractor with attractive showcards and non-technical pamphlets. He needs these to make sales as much as a miner does his pickaxe to obtain gold.

The contractor for his part must carry stocks, for it is most essential he should be in the position to satisfy his customer immediately, otherwise the opportunity may be lost.

With only these two things accomplished, sales will flow faster, but it still needs the high explosive of organised publicity to create the mighty volume, and this, in my opinion, can only be done by the co-operative efforts of the various associations.

What have they to say on the matter?

A. G. Blake.

June 21st, 1920.

Your articles headed "What is the Contractor Doing," and the subsequent correspondence interests us very greatly.

We feel that the contractor has, in the past, developed the wiring and engineering side of the business only, for the reason that the necessity of electric labour-saving appliances in the home was not apparent in view of the fact that domestic labour was plentiful and inexpensive. *Now* conditions have changed—domestic help is scarce and costly—those fortunate enough to secure any, must do as our American cousins have done in necessity, viz., purchase electric labour-saving appliances to retain the help—those less fortunate must have similar appliances to get along without it. In view of this "double market" which is crying out for appliances to aid domestic conditions, we are absolutely confident that the contractors will not fail to reorganise and develop the *commercial sales side* of their business, even more energetically than their friends in the States, who a few years ago, utilised their shop windows as more or less "rubbish dumps," but are now second to none as merchandising display windows. We, as manufacturers realise that without co-operation nothing worth while can be accomplished; hence our reason for having representatives continually in America keeping up with the times, and profiting by what has already been done. Now we have ready some of our co-operative sales help for the contractors' use, which will enable them to make good window shows of labour-saving appliances which will appeal to the womenfolk of this country.

It may interest your readers to know that we have complete window display material, showcards, life-size cutouts; also we are willing to loan electros to assist their local advertising, and supply advertising folders for distribution. This is only the beginning of what we intend to do to assist our contractor friends in their task of building up a sales organisation, which most certainly is necessary to them if they are to do their part in supplying the existing demands. The electrical contractor is as shrewd a business man as there is, and will most certainly profit by the unexpected opportunity which has arisen, and he *will do his share* and thoroughly.

L. G. Hawkins & Co.

London, W.C.
June 21st, 1920.

Non-Union Labour and Supply Undertakings.

On behalf of the Rochdale Branch of the E.T.U., I am pleased to note that District Council, No. 10 Area (Greater London), is taking the same standpoint as we did on March 1st, 1920, and may say that it has been a great advantage to our membership, since our members on the supply staff refused to connect any job or installation done by plumbers and non-unionists. As noted in another part of your valuable journal, the Rochdale supply undertaking has established a record in lighting consumers during the year, and placed £5,000 to relieve the rates. We hope every E.T.U. branch will adopt this stand, which will guarantee quality and workmanship to consumers.

H. Turner,
Secretary.

Rochdale.
June 19th, 1920.

Technical Works.

Referring to the article of Mr. Purday, which appeared in your issue of April 30th, pressure of business at that time caused that particular issue to be put aside for later consideration; if not too late, I would like to make a few comments.

I fully appreciate Mr. Purday's feeling in the matter, having myself helped to get out technical work.

Generally speaking, when searching through technical books for any special information, one obtains, say, one ounce of hard fact out of 4 or 5 lb. of extraneous matter, which causes the cost to be considerable.

There are several books which, although very valuable in themselves, are too expensive to purchase for the small amount of special information in each.

Some works also which come out annually should be re-edited, and if before they were issued, the editor or compiler of such books would communicate with engineers (dealing practically with the various subjects) he would often obtain valuable assistance.

I know of one book which I sent for, and after some difficulty I found one paragraph dealing with the particular subject in which I was interested. This paragraph was incorrect and out of date.

There are very few books dealing specifically with one subject or branch of engineering, probably because the demand for them would not be satisfactory. Even when such a book is compiled, it is very advisable to carefully consider every page before issuing a new edition, as during the past five or six years there have been many changes.

For instance, in 1914, a technical book dealing with a certain speciality was issued, and a surplus stock of matter printed (but not bound up) ready to make up another edition in the following year, but in 1919, when a new issue was imperative, the surplus sheets were found to be very troublesome, owing to altered conditions, and it was necessary, for the time being, to insert a supplement; it now means an entire revision, and practically a new book.

Mr. Purday's suggestion that the date should always be inserted is very necessary. I adopted the plan of printing the year of issue on the cover.

I enclose copy of the technical book referred to, which perhaps you will forward to Mr. Purday.

Fred Bland.

Sheffield.
June 21st, 1920.

Government Waste.

In the Press at the present moment public attention is being directed to a series of articles under the above heading. While these are drawing forth criticisms from all quarters it would be entirely misleading for the public to consider that such wilful waste takes place in all Government departments, regarding the wages of their employés.

Some time ago an article in the REVIEW drew attention to the fact that certain individuals employed by the War Department in their power stations had not received any benefit under the E.P.E.A. Award No. 9,281. However, after more than 12 months' delay, these individuals were put in receipt of the above.

It would be interesting to know whether the Minister of Labour is aware of his sanction of an additional £30 per annum to be added to the above award. Up to the present it is a minus quantity, as far as the W.D. stations are concerned.

The same article also made reference to the workers now coming under the Whitley Council scheme.

The previous increases of 5s., 3s. and 3s., granted to these men has in practically all other concerns been paid, but not so to the workers of the War Department, as will be seen from the following.

Some weeks ago a conference was held between delegates of a certain union and a representative of the War Office to settle the question of wages. However, after the representative was informed that certain parts of the district had recognised the claim, the conference closed, the only result being a waste of time on both sides, as nothing is forthcoming.

It is argued that the party which approves and sanctions these awards cannot take the lead, therefore, the humble employés must sit tight and "wait and see" if there is anything left after the squandering is finished. The upset and discontent in various central stations between employer and employed cannot be wondered at when the very thing we are striving to conquer in this country at the present time is being put into practice by these Government departments.

But there is an end to everything, the inevitable clash is bound to come sooner or later, and the Government, as in the majority of cases, must be considered as the ringleaders of the present dissatisfaction amongst workers.

Otozel.

Distribution Mains for new Housing Schemes.

The article in your issue of the 18th inst., by Mr. Wilson, mains superintendent of Maidstone, is most valuable and timely.

The very arrangement of the new colonies, giving as it does more space between the houses and more irregular outline than the stereotyped form of street, increases the cost of service work, and consideration of this distribution problem to small properties is urgently required.

Some years ago an opportunity arose for providing electricity supply to a new and comparatively large estate of small villas, built, however, on comparatively old-fashioned lines; that is to say, in rows, and with small gardens.

In this case the supply was distributed in the form of single-phase A.C., and the method adopted—which proved inexpensive and satisfactory—was to lay down each side of each road one lead-covered armoured cable consisting of four cores, two outers and one neutral for balanced three-wire single-phase supply, and in addition one switch wire for public lighting.

This cable was not looped into the houses, services being put on in the old-fashioned manner with "T" joints.

The public lamps were also connected in the same way, but through the switch wire so that a large number could be turned "on" and "off" in groups from a central point.

At the junctions of roads a public lamp was fitted, the post having a special and enlarged base containing simple link gear to which the various cables at that point were brought, constituting in fact a small feeder pillar.

This arrangement worked very well, permitting services to be put on from time to time with minimum expense, made sectionising and testing easy, and provided for an inexpensive form of street lighting control.

The provision of a small switch wire in the main cable was probably not new, but is certainly worthy of attention even if public lighting is not immediately required, as the extra cost is very small. There are perhaps manufacturing difficulties in including the small switch wire in a cable of which the other cores are relatively large, but for the requirements of the ordinary housing colony, runs of ¼ to ½ mile from transformer kiosks, and work of that kind, the method offers many advantages.

The British Electrical Development Association, Inc.

London, W.C. 2.
June 21st, 1920.

Situations Vacant.

With reference to the correspondence appearing in the ELECTRICAL REVIEW with regard to the use of box numbers by advertisers, I think that it will interest your readers to consider the question from the advertiser's point of view.

I wish first of all to state that I am not an employer, but an employé (also a trade unionist) engaged by a large firm of engineers. Amongst my duties for my principals I have to engage assistants for various positions.

During the past years, having read many letters in the ELECTRICAL REVIEW on the much-debated subject of using box numbers by advertisers, I sided with the views expressed by your many correspondents, that this system of advertising vacant positions was a pernicious one. I therefore determined when advertising to use my firm's name and address; but after a few trials I had to revert to the box number again, as the results obtained by giving a name and address can hardly be credited. In reply to an advertisement, I have received at times hundreds of applications for a job, and then the trouble commences. Customers and friends will telephone or write asking that their friend Mr. So-and-So should be given the appointment, rarely discriminating whether the man's qualifications are suitable or not. I am not exaggerating when I state it is the rule rather than the exception to get a large number of these appeals, and in addition, although an advertisement may distinctly state that application is to be made by letter only, applicants from near and far will persistently call, resulting in a great loss of time to themselves and the advertisers. Now, most of the firms that use a box number are manufacturers, and from the above facts one can easily realise it would not be good policy on their part to risk the goodwill of various customers and their friends by creating disappointment.

Again, on the question of "state salary," I am afraid that this is primarily attributable to certain applicants, who, when applying for a position, and where a definite salary is offered, endeavour to secure the job by offering to take it at a lower

figure. I am sorry to state that in my experience I have had such offers. Needless to state, with any reputable firm these applications find their way to the waste-paper basket. However, in these days, there should not be any trouble in the question of "state salary," as every staff engineer should join either the E.P.E.A. or the S.T.E., whose officials will assist them in every way on this particular point. My view is, that where an applicant replies to an advertisement under a box number he is fairly sure of a square deal, since his application is considered on his merits alone.

Resident Engineer.

[This correspondence is now closed.—Eds. Elec. Rev.]

Staff Salaries and Conditions of Service.

In the Electrical Review of June 4th appeared a leading article headed "Situations Vacant," which, after commenting pithily on some of the practices of certain employers, issued an invitation to the Society of Technical Engineers to abandon its secretive attitude. In the same week's issue of *The Electrician* there appeared two leaderettes referring to the recently-made agreement between the employers and staffs of the electrical supply industry. The latter of these two articles sounded a note of warning about the dangers of standardisation of salaries.

During the last few months such comments, usually brief, and directed towards one particular section of the general problem, have become increasingly common, but so far no general résumé of the whole subject covered by the title above has appeared in any of the technical papers concerned.

I think we are justified in assuming from the evidence that the engineer, both electrical and mechanical, long-suffering though he may be, is at last becoming vocal under the pressure of conditions which, bad as they have been during the last two decades, are fast becoming almost intolerable.

There is a deal of confused thinking about the subject, and it will be my attempt in this article to focus attention upon what appear to be the fundamental points requiring consideration.

I think that the following summary will meet with the agreement of all concerned:—

1. That in relation to other professions and businesses demanding the same degree of education, training and sense of responsibility, the electrical engineer was very poorly paid even before the war, and his conditions of service were often unnecessarily harsh.

2. That advances of salary, especially in the higher grades, during the last five years, have been totally disproportionate to the increase in cost of maintenance of a home and family, and conditions of service have deteriorated rather than improved.

3. That only by raising the remuneration and improving the conditions of service of the *average* man shall we obtain a contented staff fitted to give its whole mind to its special task of increasing the efficiency of the joint action of Capital and Labour.

4. That whatever the defects and dangers of association may be it is an incontrovertible fact that association with other individuals and groups is usually necessary before any improvement in the conditions of the general mass of those affected can be secured.

5. That failing the central station staffs, which are represented by the E.P.E.A., no section of the industry has a staff association which is of the slightest use to it.

It may be said that the S.T.E. represents other sections of the industry, but it is at least doubtful whether this is really the case or not. In the opinions of many engineers who have watched the operations of this concern, both from the inside and the outside, it seems clear that as at present constituted and directed, this society is likely to be of very little use. I would go further, and would say that personally I have come to the conclusion that the symptoms indicate that it has fallen a victim to an infantile form of that most insidious of all association diseases, namely, paralysis.

In evidence of this, I call attention to the apparent abandonment by its Council of all attempts to adequately control the actions of its paid servants, and its failure to publicly proclaim a definite policy and secure the help of the technical journals and friendly employers.

The Society's public, or rather semi-public utterances, are chiefly noticeable for their contradictory character, and the fact that they never by any chance indicate that there is any real guiding principle or inspiration behind its efforts. At one of the propaganda meetings which I attended, the speakers, almost without exception, voiced adherence to a policy which it is complimentary to describe as wholly opportunist and unworthy of any association with any real idea of its own dignity or that of its members.

I fear that at present the S.T.E. is not merely useless, but is actually dangerous, because it is still occupying the time of men who might more usefully help a real and progressive association, and it is at the same time making enemies even amongst those employers who sympathise with the legitimate aims and objects of the profession as a whole.

In this connection it must not be forgotten that whilst many employers show that they fully appreciate the position, they, after all, are in the minority, and are restricted from giving full effect to their views by the force of competition, and occasionally by the operations of their various employers' associations.

The central station staffs agreement referred to above, should be welcomed by all electrical men, for the reason that if salaries and conditions can be improved in this branch, bound down as it is by limitations on its charges for services rendered, &c., these improved salaries will eventually form the base for further improvement in the other branches of the industry which are not so bound.

It may be argued that this will further increase the cost of manufacture, and contribute to the much talked of forthcoming "slump," but it does not seem to be generally realised that the increases of "staff" pay in electrical manufacturing industries have had only a microscopic effect upon the total cost of production.

The Electrician, in the article referred to above, drew attention to the dangers of standardising salaries, but surely this danger only exists if an attempt is made to bind down members of the association not to take more than the basic salary. I cannot, in the published reports referring to the agreement in question, find any indication that this stupid policy of the workmen's trade unions has even been contemplated. Provided that there is no such limitation it is obvious that the man above the average will still be able to command a higher salary than the basic rate, but whereas, if the normal rate were £500 he would have to consider himself well paid at £750, he would probably have no difficulty in obtaining £1,100 to £1,200 if the basic rate became, say, £800 to £900, and so on throughout all the grades.

I contend that wha tis required is a real live association governed and directed by men of reasonable but determined character, who could earn and maintain the respect of the employers' representatives, and who would be able to command the allegiance of their fellow employés. They must be men to whom principle means more than opportunism, and to whom secrecy as regards policy and negotiations is abhorrent.

Further, I think that the efforts of all men who have the interests of the industry at heart should be directed towards making both employés, staff, and what is usually called Labour, realise that the technical and management staffs in the engineering industry (and for that matter in all industries) are, and must remain, a *third party* in industry.

They cannot exist without Capital on the one hand, and Labour on the other; but nevertheless it is true that neither Labour nor Capital can produce anything without them except where the capitalists themselves possess both the necessary ability and time to direct their own businesses. Such cases are becoming more rare every year, although many cases of partial direction still exist.

The staffs cannot ally themselves entirely with Capital because they are after all in the position of workers, and they cannot ally themselves definitely with Labour, because they must stand as representatives or judges between Capital and Labour.

They cannot serve the best interests of either Capital or Labour unless they are impartial and free to form and voice independent opinions, and they cannot be impartial if they are members of an association controlled by either Labour or Capital. Nor, being sufficiently conscious of their own strength and requirements, need they take up any such false position.

Garton Le Roet.

June 20th, 1920.

[We regret that pressure upon our space compels us to hold over several letters until next week.—Eds. Elec. Rev.]

Oversea Transmission.—Mr. Aarstad, chairman of the Norwegion Waterfall Commission, has been asked about the standpoint he had assumed concerning the possible transmission of electrical energy from Norway to Denmark. In reply, he is reported to have stated that the question had been put before the Commission for the expression of an opinion, and they had recommended the dispatch of a friendly reply to Denmark's application for the appointment of a joint committee. There was no doubt, he said, that Norway could give a supply to Denmark, and the committee would have to consider the extent of such transmission, both technically and economically. He apprehended that the power would be very costly on reaching consumers in Denmark.

Electrical Workers and the Military.—Our Dublin correspondent writes: In connection with the decision of Dublin dockers not to handle military munitions or equipment, the North Wall electric crane men last week refused to work the crane for assisting the military in the discharge of stores which had arrived from Southampton by the s.s. *Agnes Duncan*. The military then commandeered the electric power house belonging to the Dublin Port and Docks Board, but the employés there refused to work the plant, and it was intimated that if the military themselves attempted to do so, the entire electric power at the port would be stopped by the men, all the other crane-drivers refusing to work. This would have led to general dislocation. Ultimately the military withdrew from the power house, and the employés resumed work there as usual. Later, the military discharged the cargo of the *Agnes Duncan* with the aid of the ship's steam winches and derricks.

NEW PATENTS APPLIED FOR, 1920.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. SEPTON-JONES, O'DELL AND STEPHENS, Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

15,316. "Electric signalling systems." WESTERN ELECTRIC Co. June 7th.
15,317. "Electrode-locking devices for electric welding machines." J. Ledwinka. June 7th. (United States, May 19th, 1919.)
15,326. "Switch for electrical circuits." A. Messinger and L. Pap. June 7th.
15,335. "Electrical fuses of the cartridge type." METROPOLITAN-VICKERS ELECTRICAL Co. June 7th. (United States, July 5th, 1919.)
15,336. "Automatic spark advance for magnetos." G. B. Gousset. June 7th. (France, June 20th, 1919.)
15,337. "Contact-breaker for ignition magnetos." G. B. Gousset. June 7th. (France, June 20th, 1919.)
15,338. "Collector ring for four-cylinder engines without commutator." G. B. Gousset. June 7th. (France, June 20th, 1919.)
15,344. "Generation of alternating current." BRITISH THOMSON-HOUSTON Co. June 7th. (United States, October 29th, 1913.)
15,346. "Electric meters." BRITISH THOMSON-HOUSTON Co. and A. P. YOUNG. June 7th.
15,347. "Electric lamps." BRITISH THOMSON-HOUSTON Co. (General Electric Co.). June 7th.
15,348. "Mercury, &c., vapour electric lamps." SELICIA SYNDICATE. June 7th.
15,349. "Manufacture and production of graphite electrodes." UNITED ALKALI Co., C. L. HIGGINS and D. A. PRITCHARD. June 7th.
15,350. "Piezo-electric device." A. F. R. COTTON and E. W. C. RUSSELL. June 7th.
15,358. "Arc lamps." F. PORTER and J. W. SMITH. June 7th.
15,378. "Transmission of messages, &c., by electrical means." EVERSHED & VIGNOLES and A. G. MOORE. June 7th.
15,380. "Tubular electric condenser and method of manufacturing same." G. GILES. June 7th. (Switzerland, June 16th, 1919.)
15,399. "Electrical power transmission systems." A. M. TAYLOR. June 8th.
15,434. "Ignition apparatus for internal-combustion engines." H. V. CHANDLER. June 8th.
15,441. "Electric furnaces." B. E. D. KILBURN (Norske Aktieselskab for Elektro-kemisk Industri Norsk Industri-Hypotekbank). June 8th.
15,449. "Electrical signalling-apparatus." W. L. WALKER. June 8th.
15,468. "Multi-phase machines." SIEMENS SCHUCKERTWERKE. June 8th. (Germany, December 14th, 1917.)
15,478. "Coupling for magnetos of internal-combustion engines." F. M. PADIAN and F. R. RAM. June 8th.
15,485. "Vibrating-apparatus for sound-signalling." SIGNAL GES. June 8th. (Germany, October 23rd, 1915.)
15,498. "Storage battery plates." J. F. MONNOT. June 8th.
15,517. "Apparatus for electric transmission of angular indications." A. L. RAWLINGS and S. WARD. June 8th.
15,544. "Electrically-operated curtain-controlling mechanism." F. E. CLIPSTONE. June 9th.
15,570. "Electro-magnetic drill stand." L. R. HORNE. June 9th.
15,572. "Overhead trolleys for electric tramways, &c., vehicles." T. BLANEY and D. WILLIAMS. June 9th.
15,576. "Electric push-button switches." E. N. BRAY & BRAY, MARKHAM & REISS. June 9th.
15,587. "Electric heating apparatus." SOC. ANON. DES ETABLISSEMENTS L. BLERIOT. June 9th. (France, February 5th, 1919.)
15,590. "Sparking plugs, couplings, terminals, &c." J. I. D. and K. D. STEVENSON. June 9th.
15,593. "Electro-deposition of metals." R. W. LAWSON and A. I. G. WARREN. June 9th.
15,596. "Combined electrical conductors and casing therefor." N. PRENTICE. June 9th.
15,599. "Device for supporting receivers of desk telephones." D. R. LOCH. June 9th.
15,601. "Sound producers and receivers." SIGNAL GES. June 9th. (Germany, March 9th, 1916.)
15,602. "Electric lamps." BRITISH THOMSON-HOUSTON Co. June 9th. (United States, November 30th, 1917.)
15,631. "Electrical measuring-instruments." A. COPELIN and EDISON SWAN ELECTRIC Co. June 9th.
15,632. "Wireless telegraph valves." F. A. COULDING and EDISON SWAN ELECTRIC Co. June 9th.
15,646. "Manufacture of thermo-electric metals and alloys." W. C. HERAEUS GES. June 9th.
15,655. "Electro-magnetic clutches and change-speed gearing." Sir C. S. FORBES. June 9th.
15,659. "Telephone apparatus." P. J. HACKETT. June 9th.
15,660. "Signalling circuits." P. J. HACKETT. June 9th.
15,668. "Electrical alarm clock." C. C. BROUGH. June 10th.
15,673. "Portable electric dust exhauster." G. R. BIMM. June 10th. (France, January 17th, 1914.)
15,679. "Electric step-by-step, &c., motors." C. L. WALKER. June 10th.
15,687. "Electrical contacts for fuse boards, distribution boards, &c." B. QUARMBY. June 10th.
15,692. "Electro-magnetic mechanism." C. L. WALKER. June 10th.
15,700. "Electric switches." A. CHRISTIE and R. METCALFE. June 10th.
15,704. "Electric switches." E. BOLTON and the COVENTRY MOVEMENT Co. June 10th.
15,706. "Electrical appliance for cleaning and polishing." I. D. ORR. June 10th.
15,717. "Vacuum tubes, &c." RADIO COMMUNICATION Co. and J. SCOTT-TAGGART. June 10th.
15,726. "Electrical indicators." J. C. WRIGHTON and EDISON SWAN ELECTRIC Co. June 10th.
15,727. "Telephone transmitter." WESTERN ELECTRIC Co. June 10th. (Norway, June 22nd, 1914.)
15,728. "Electric lighting apparatus for cycles, &c." SOC. ANON. DES AUTOMOBILES ET CYCLES PEUGEOT. June 10th. (France, June 13th, 1919.)
15,731. "Telephonic call systems." R. C. M. HASTINGS. June 10th.
15,734. "Electrically-operated implement for cutting crops." G. FRYER. June 10th.
15,740. "Electric lamps for motor vehicles." P. FRANK and KYNOCH, LTD. June 10th.
15,746. "Electrical precipitation of solid materials from gases." J. E. LILIENFIELD and METALLBANK UND METALLURGISCHE GES. June 10th. (Germany, March 6th, 1916.)
15,775. "Electro-osmotic separation of substances." ELEKTRO-OSMOSE AKT. GES. (Graf. Schwerin Ges.). June 10th. (Germany, April 8th, 1918.)
15,791. "Spark plugs." W. HOUSMAN. June 10th. (United States, November 26th, 1917.)
15,793. "Systems of electrical distribution." A. E. WHITE (U.S. Light & Heat Corporation). June 10th.
15,797. "Sparking plugs." H. WILLIAMS. June 10th.
15,812. "Handle for electric arc welding." J. DOOLEY. June 11th.
15,814. "Electric switch." A. G. BULLEN, A. G. BULLEN & Co., and R. L. JENKINSON. June 11th.
15,850. "Electric wiring." G. F. A. STONE. June 11th.
15,857. "Telephone systems." WESTERN ELECTRIC Co. June 11th.
15,861. "Process for manufacture of metallic diaphragms of electrolytic cells." R. PECHKRANZ. June 11th. (Switzerland, June 12th, 1919.)
15,862. "Conversion of continuous or direct currents into alternating currents." F. BREISIG. June 11th. (Germany, March 11th, 1919.)
15,872. "High-voltage electric installations." SIEMENS SCHUCKERTWERKE. June 11th. (Germany, July 30th, 1919.)
15,888. "Means for preventing actuation of electric switches, gas cocks, &c." G. FINLAY. June 11th.
15,902. "Apparatus for protection of three-phase current circuits." C. ZORZI. June 11th.
15,905. "Electrical insulating bushings." F. M. DENTON. June 11th.
15,909. "Electrical transformers." E. DE H. DUVAL. June 12th.
15,912. "Device for aligning trolley wheels with overhead transmission wires." H. GEORGE. June 12th.
15,924. "Primary galvanic batteries and electrodes and manufacture of such electrodes." E. W. JUNGNER. June 12th. (Sweden, June 17th, 1919.)
15,935. "Electrical transmission systems." A. M. TAYLOR. June 12th.
15,936. "Electric lamp holders." A. B. GOLDSMITH. June 12th.
15,947. "Electrical transformers." G. SCHROEDER. June 12th.
15,957. "Tuning-instruments for wireless telegraphy and telephony." H. P. REES. June 12th.
15,986. "Systems of electric ship propulsion." BRITISH THOMSON-HOUSTON Co. and D. E. JEWETT. June 12th.
15,987. "Dynamo-electric machines." BRITISH THOMSON-HOUSTON Co. and H. W. TAYLOR. June 12th.
15,995. "Leading-in insulators." G. V. TWISS. June 12th.
15,997. "Starting, generating and ignition apparatus for internal-combustion engines." W. B. MOSES. June 12th. (United States, June 29th, 1917.)
16,008. "Multiple twin telephone and telegraph electric cables." C. R. BOLTON and BRITISH INSULATED & HELSBY CABLES, LTD. June 12th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1918.

1,434. MULTI-SPEED ALTERNATING-CURRENT MOTORS. British Thomson-Houston Co. (General Electric Co.). January 29th, 1916. (143,272.)

1918.

7,309. MACHINE-SWITCHING TELEPHONE EXCHANGE SYSTEMS. Western Electric Co. and L. Polinkowsky. May 1st, 1918. (143,277.)
11,478. ELECTRIC INSULATION. Elektro-Material Ges. April 11th, 1918. (143,280.)

1919.

3,693. ELECTRIC FURNACES. W. E. Moore. February 14th, 1919. (143,292.)
4,057. COUPLINGS FOR PROTECTED OR ARMOURED ELECTRIC CABLES FOR USE UNDER WATER AND ELSEWHERE. V. C. H. Gibson. February 18th, 1919. (143,308.)
4,065. REDUCTION OF DISTORTION OF HIGH-FREQUENCY CURRENTS PARTICULARLY APPLICABLE TO WIRELESS TELEPHONY. Western Electric Co. February 18th, 1919. (143,309.)
4,387. ASSEMBLING OF ELECTRIC BATTERIES. London Battery Co. and E. W. Clarke. February 21st, 1919. (143,322.)
4,509. ELECTRICAL ACCUMULATORS. C. H. Worsnop. February 24th, 1919. (143,327.)
4,579. ARRANGEMENT AND CONNECTOR FOR JOINTING OF ELECTRICAL WIRES. J. S. Mollerhoj. February 24th, 1919. (143,328.)
4,745. ELECTRIC CONNECTORS. G. Duveau. March 18th, 1914. (123,770.)
5,185. CUTTING AND WELDING METALS BY THE ELECTRIC ARC. C. G. Conradi. March 3rd, 1919. (143,331.)
8,943. ELECTRIC-LIGHTING SETS MORE ESPECIALLY FOR USE WITH MOTOR-CYCLES. Efandem Co., W. Owen and F. E. Cutler. April 9th, 1919. (143,358.)
10,197. MACHINES FOR MAKING BOBBINS FOR ELECTRIC BATTERIES. National Carbon Co. January 10th, 1918. (125,991.)
10,198. MACHINES FOR MAKING BOBBINS FOR ELECTRIC BATTERIES. National Carbon Co. January 10th, 1918. (125,992.)
10,644. ELECTRICAL TRANSMISSION DISENGAGING LOCK-SWITCH. J. J. Wheatley. April 30th, 1919. (143,372.)
11,123. CONTROLLING AND REGULATING SYSTEMS FOR DYNAMOS, APPLICABLE ALSO AS MOTOR-STARTING SYSTEMS. W. J. Rickets. May 5th, 1919. (143,378.)
12,613. PORTABLE ELECTRIC LAMP SPECIALLY ADAPTED FOR USE BY POLICE OFFICERS ON DUTY. F. W. Dowty. May 20th, 1919. (143,387.)
13,527. SPARKING PLUGS FOR INTERNAL-COMBUSTION ENGINES. L. Macquaire. May 28th, 1919. (143,395.)
14,464. SUPPORT FOR ELECTRIC INCANDESCENT LAMPS. J. P. Johansson. June 6th, 1919. (143,404.)
14,977. WIRE COUPLINGS FOR SPARK-PLUGS. Soc. Anon. des Automobiles et Cycles Peugeot. July 23rd, 1918. (130,321.)
15,080. REGULATING-SYSTEMS FOR DYNAMO-ELECTRIC MACHINES. W. J. Rickets. June 16th, 1919. (143,413.)
15,116. ELECTRIC SWITCHES. Benjamin Electric, Ltd. September 13th, 1918. (132,492.)
18,637. TRAFFIC-CONTROLLING APPARATUS FOR RAILWAYS AND THE LIKE. McKenzie, Holland & Westinghouse Power Signal Co., H. H. Dyer and R. G. Davey. July 26th, 1919. (143,437.)
18,711. METHOD OF AND APPARATUS FOR RECOGNISING AIRCRAFT BY ACOUSTIC MEANS AND FOR ACOUSTIC-TELEGRAPHY BETWEEN AIRCRAFT AND THE EARTH. A. Berniei. July 27th, 1918. (130,605.)
20,830. EXTENSIBLE ELECTRIC LAMPS FOR MOTOR AND OTHER VEHICLES, BOATS, AND THE LIKE. B. J. Grigsby. August 25th, 1919. (143,448.)
21,586. ELECTRIC MINER'S LAMPS. O. Schneider and F. Schlegel. November 9th, 1918. (135,163.)
22,127. ELECTRO-MAGNETIC WAVE NAVIGATIONAL SYSTEMS. W. P. Thompson (J. Betamod). September 9th 1919. (143,456.)
22,173. APPARATUS FOR DIMINISHING THE INJURIOUS EARTHING CURRENTS IN EARTHED HIGH-PRESSURE NETS HAVING A CAPACITY THAT IS NON-SYMMETRICALLY DISTRIBUTED OVER THE PHASES OF THE NET. Akt. Ges. Brown, Boveri et Cie. December 23rd, 1918. (137,032.)
25,302. ELECTRIC PUSH-BUTTON SWITCHES. A. Cesaro. February 8th, 1919. (138,854.)
28,388. FIXING-ARRANGEMENT FOR ELECTRIC MEASURING INSTRUMENTS. Siemens & Halske Akt. Ges. August 23rd, 1918. (135,219.)

1920.

579. MAGNETO-ELECTRIC MACHINES WITH OSCILLATING ARMATURES. O. Imray (Eisemann Magneto Corporation). January 7th, 1920. (143,480.)
1,570. METHODS OF PROTECTING ELECTRIC NETWORKS COMPRISING ARMOURED CABLES WITH MULTIPLE CONDUCTORS. P. M. J. Boucherot and Soc. Alsacienne de Constructions Mecaniques. May 1st, 1914. (138,075.)

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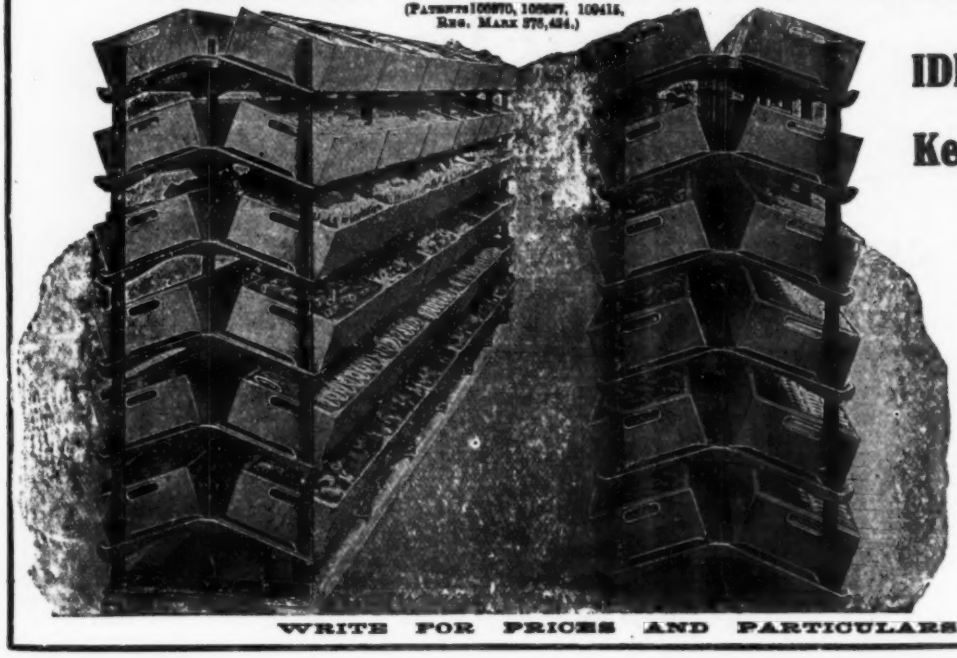

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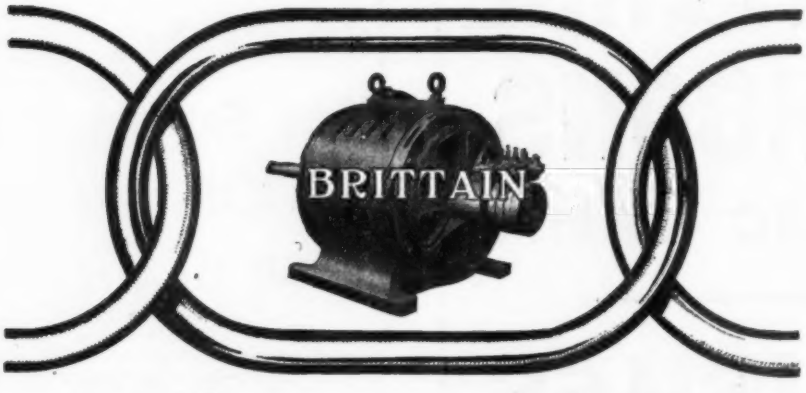

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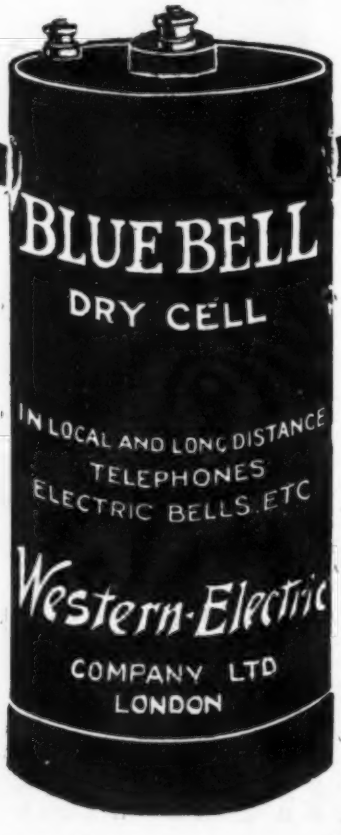

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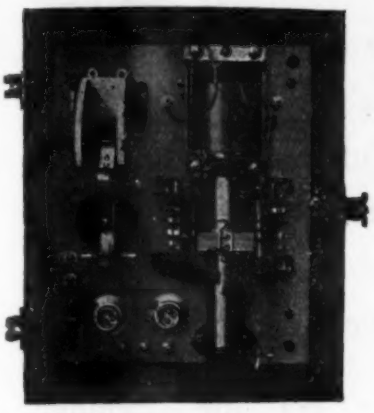

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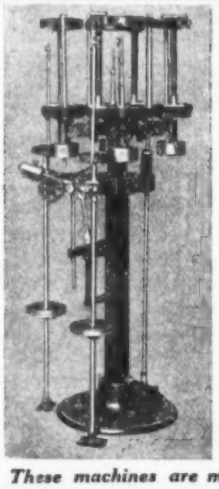

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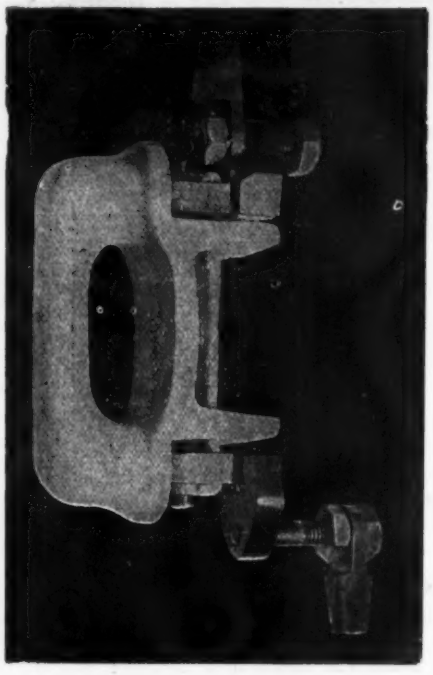

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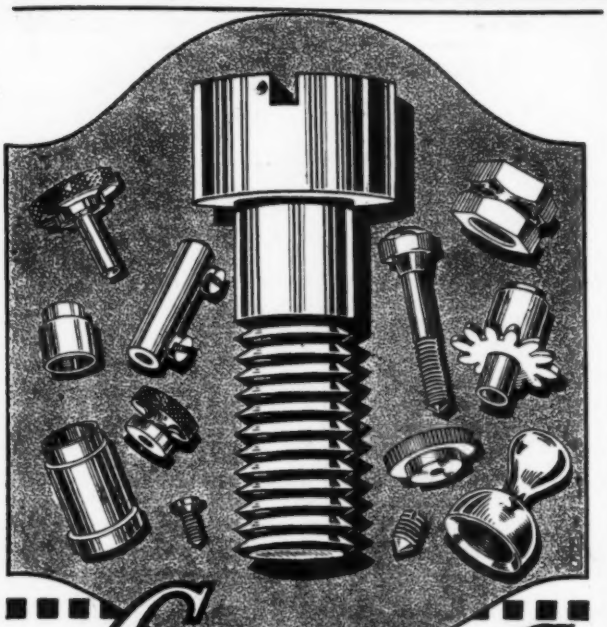

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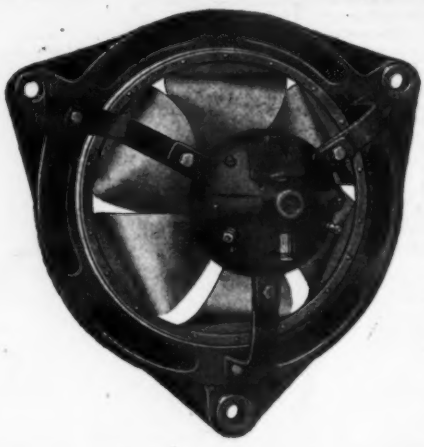

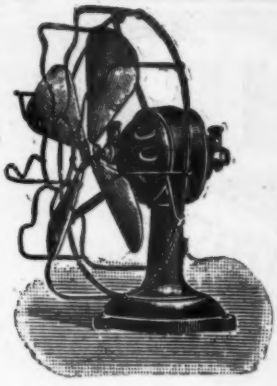

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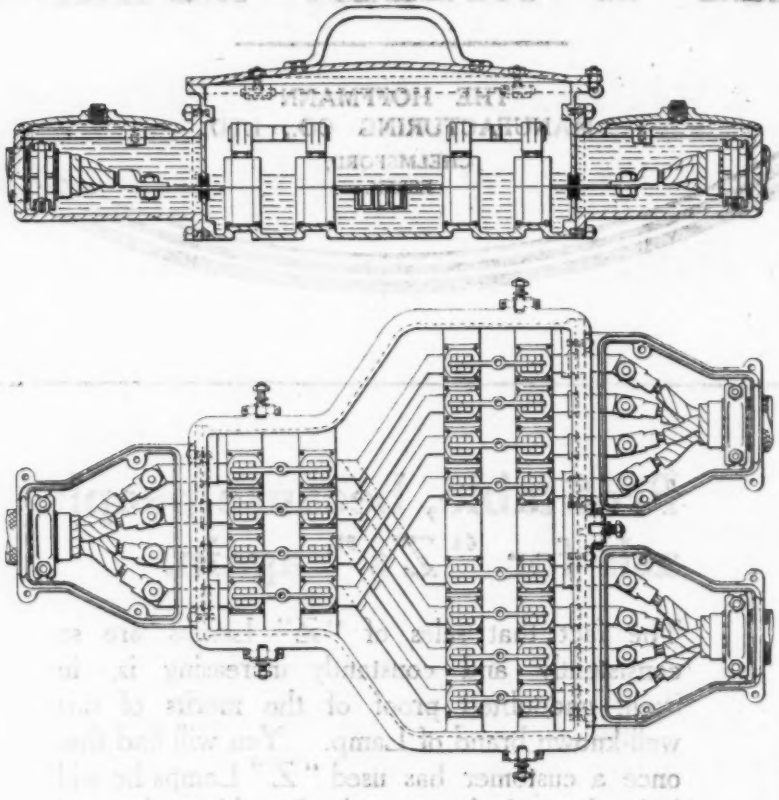

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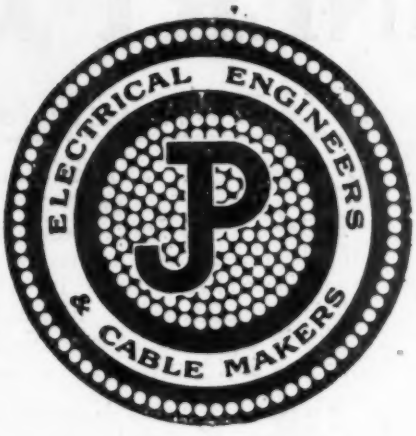

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There are many in the Electrical Industry to-day who have known the J. P. Mark for many years, some for nearly half a century—and those who know it best associate it with a standard of excellence in Cables and Electrical Plant rarely, if ever, maintained consistently over so long a period.

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			SQUARE TYPES		
S	1·5	·210	28	1¼ × 4⅜	— 8½
A	1·5	·155	38	1⅛ × 5½	1 2
P	1·5	·125	84	2¼ × 5⅛	1 9
O	1·5	·125	108	2¼ × 6⅛	2 12
19A	1·5	·120	160	3⅛ × 6⅛	3 9
19	1·5	·110	220	3⅛ × 7⅛	4 8
M	1·5	·100	310	4¼ × 8	5 2
			ROUND TYPES		
Y	1·5	·125	100	2⅞ × 6½	2 6
2	1·5	·150	70	2⅞ × 7	1 14
2 A	1·5	·140	80	2¼ × 6½	1 4

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To render active it is simply necessary to fill the cell with water. After a few minutes more water is required to replace that absorbed. The cell is then a freshly-made Dry Cell. Any surplus water can be emptied out after a few hours.

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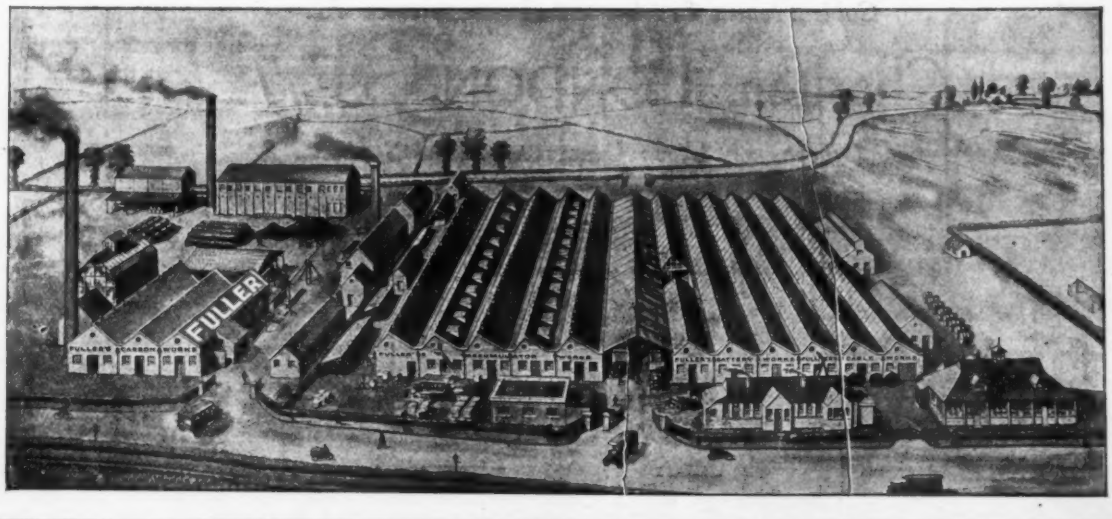

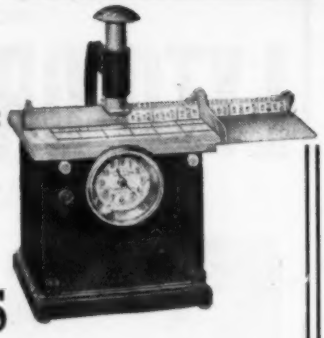

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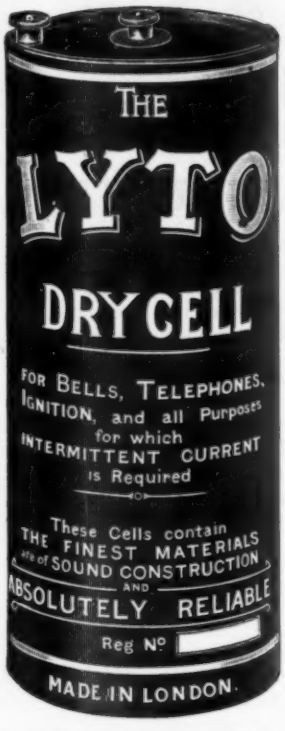
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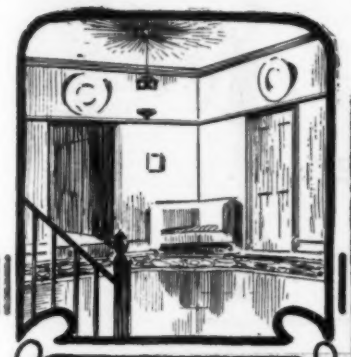

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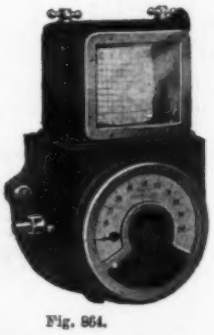

Fig. 864.

For Particulars apply to the Makers :—

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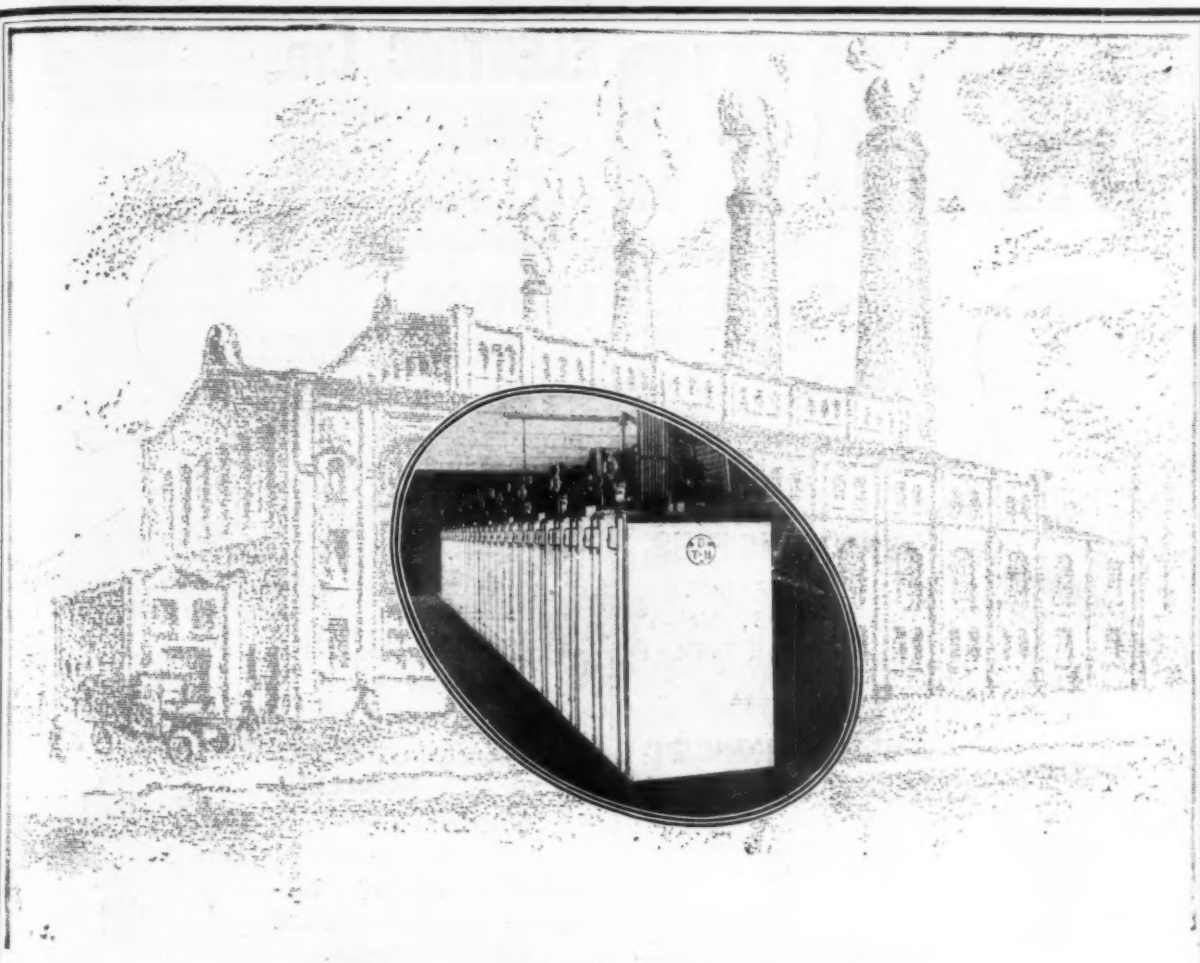

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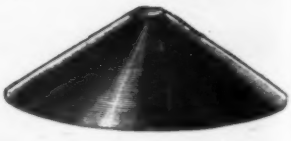

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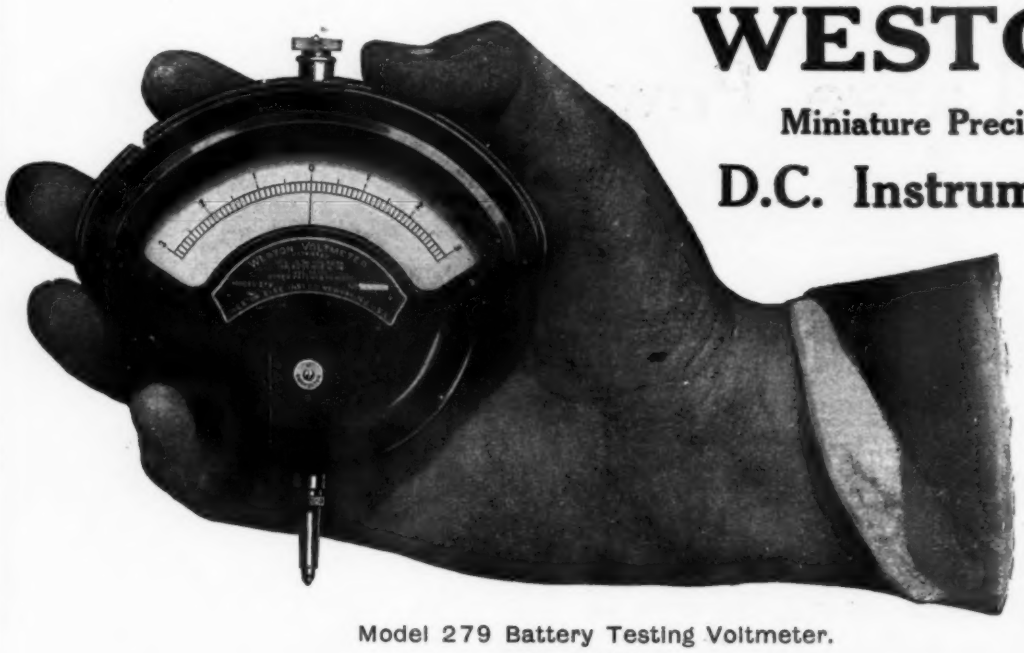

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Model 279 Battery Testing Voltmeter.
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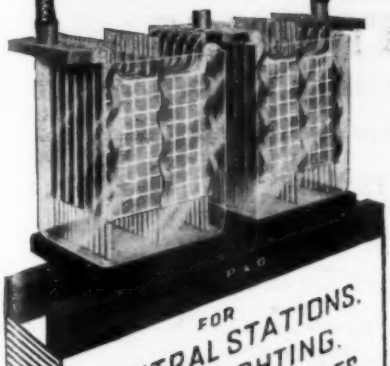

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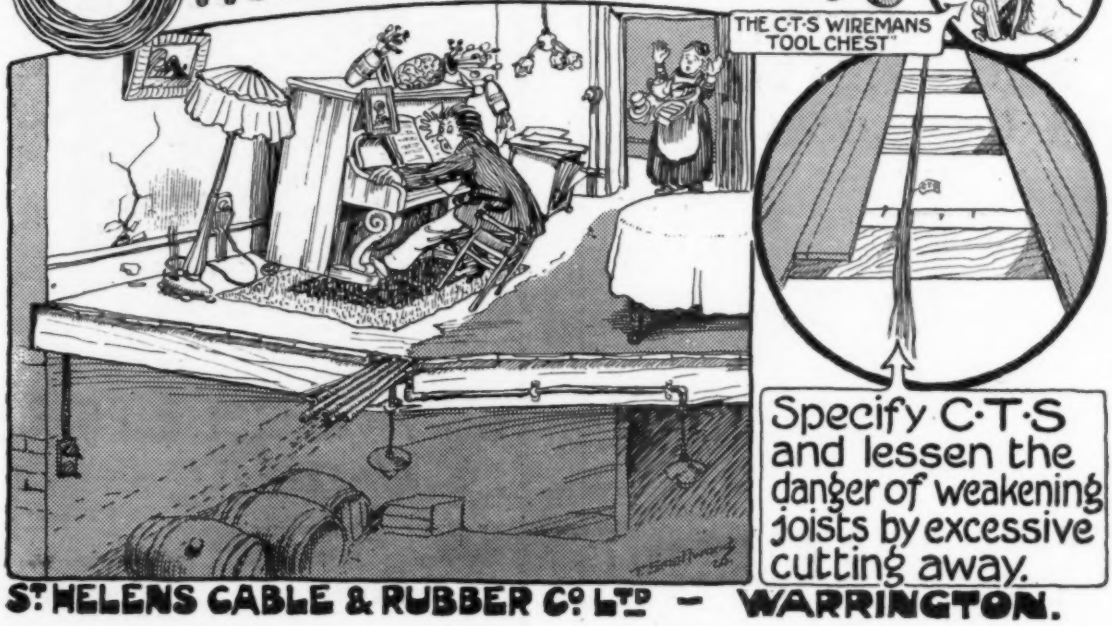

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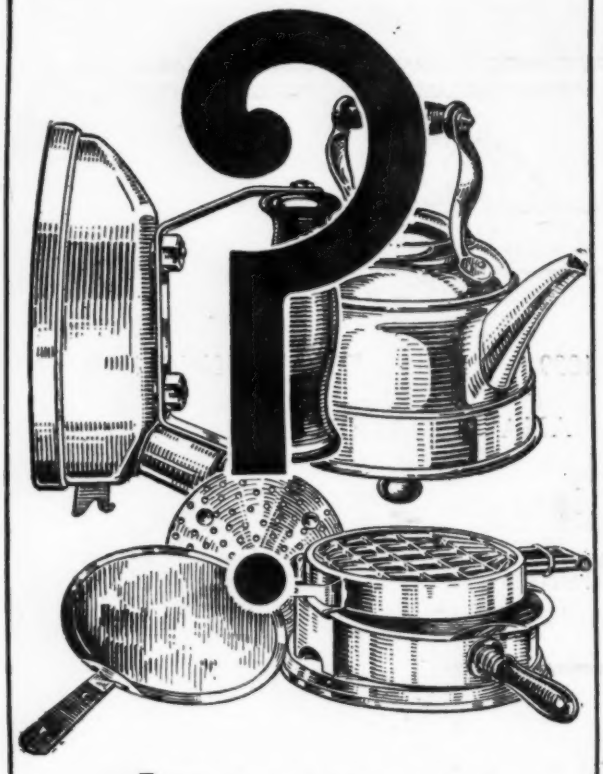

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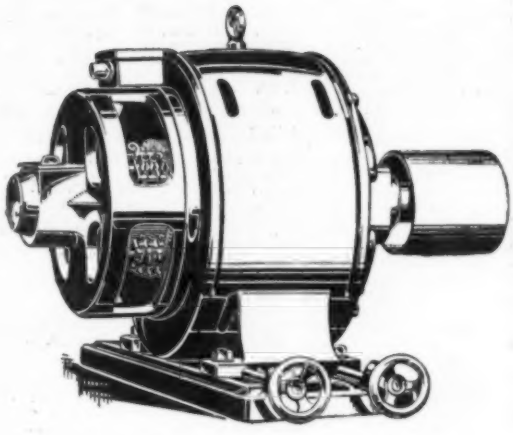

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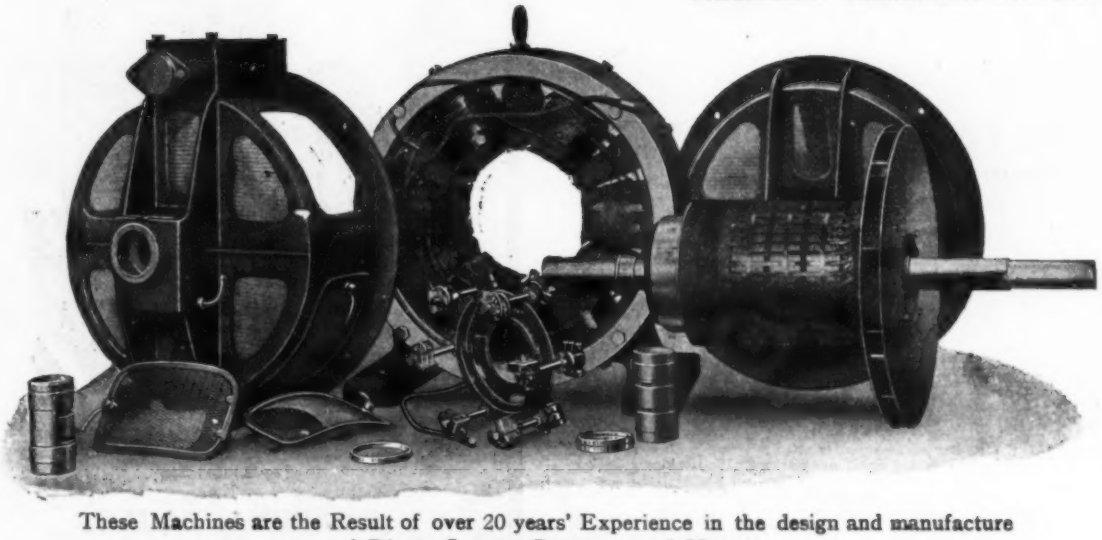

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CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and ever care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ALDERSHOT.—Schools and handicraft centre for the U.D.C.; the Clerk.
ALLOA.—Extensions, Municipal Buildings; Burgh Surveyor.
ALTHORPE (Doncaster).—Works for the Southern Cotton & Oil Co. (Great Britain), Ltd.
AMBLECOTE (Stourbridge).—Foundry, Old Wharf Road, for Jones & Attwood, Ltd.
ANNAN.—Houses for the T.C.; J. B. Gladstone, architect, 100, High Street, Lockerbie.
AYR.—Extension of tuberculosis hospital (£4,750); J. Young, burgh surveyor.
BANBURY.—Works for Fenton & Radcliffe, Coventry. Houses for the T.C.; H. E. Jarvis, architect, Rotherham.
BARNOLDSWICK.—New Sunday school premises for Trustees, Congregational Church.
BATHFORD.—Additions, North Bridge Street, for the Bathgate Bonanza, Ltd.
BATLEY CARR (Yorks.).—Bank, Town Street, for the London Joint City & Midland Bank, Ltd., London.
BEDFORD.—Kinema, Mill Street, for the Bedford Picture Theatre Syndicate.
BIRKENHEAD.—Alterations, 112, Grange Road, for Bairnson & Nolan, outfitters. Alterations and additions to the Infirmary, Tranmere Road, for B. of G.; E. Kirby & Sons, 5, Cook Street, Liverpool. Alterations, 340-348, New Chester Road, Rock Ferry, for Messrs. Austin, house furnishers.
BIRMINGHAM.—229 houses; F. T. Cox, Housing Director, Market Buildings, Moat Lane.
BIRTLEY (Co. Durham).—Bank, for Barclay's Bank, Ltd.
BLACKBURN.—Conversion of old Conservative Club premises, Clayton Street, into Jewish Synagogue; Rabbi.
BOURNE END (Bucks.).—Alterations to the Railway Hotel; Mr. Rowe, architect, Marlow.
BOWLAND.—Housing scheme for the R.D.C.; H. Gradwell, architect, Blackburn.
BRAMPTON (Cumberland).—Cottage hospital for the War Memorial Committee; T. Beaton, hon. secretary.
BRIDLINGTON.—Extension of Prince's Parade with block of premises; Borough Surveyor.
BRIGG (Lincs.).—Alterations and new show rooms for J. E. Green, house furnisher, Bigby Street.
BRIDGNORTH (Salop).—32 houses for the T.C.; the surveyor. Alterations for Lloyds Bank, Ltd., London.
BURNHAM (Somerset).—Houses for the U.D.C.; the surveyor.
BURNLEY.—Art gallery and museum, near Bank Hall; Exors. of late J. W. Thompson, J.P., Oak Bank.
BURTON AGNES (Yorks.).—Reinstatement Burton Agnes Hall; Capt. T. L. Wickham-Boynton.
BUXTON.—Reconstruction of Midland Hotel and the Natural Baths (£25,000); Surveyor to the Council.
CALVERLEY.—Housing scheme for U.D.C.; W. Walker, Surveyor to the Council.
CARLISLE.—Electric light installation, Holy Trinity Church; Rev. R. W. A. Ecroyd, vicar. Bank premises, Devonshire Street and Lowther Street. Alterations, Victoria Hotel, for F. Fairbairn; S. W. B. Jack, architect, 19, Lowther Street.
CARLUKE (Co. Lanark).—Housing scheme (54 houses) at Sandy Road; A. W. Paterson, District Clerk.
CASTLE-DOUGLAS.—Houses for the T.C.; W. F. Crombie, architect, Benmore, and 98, Irish Street, Dumfries.
CHESTER.—Headquarters and hostel for the Y.M.C.A.; the secretary. Handicraft centre, Training College, and extensions to County Schools (£15,000), for Cheshire E.C.; Mr. Beswick, County Architect, Chester.
CHIRK.—Housing scheme; Berrington, Son & Watney, architects, Prudential Chambers, Wolverhampton.
COBHAM.—24 houses for Epsom R.D.C.; L. Martin, architect, Waterloo Place, Pall Mall, S.W.
CREWE.—Pavilion at Earl of Crewe Hotel, Nantwich Road; licensee.
DEWSBURY.—Extension of the Technical Schools (£17,500); Secretary to the Education Committee.
DOBCROSS (Saddleworth).—Weaving mill extensions; Co-operative Wholesale Society, Balloon Street, Manchester.
ECCLES.—Additional Municipal Offices; Borough Engineer, Eccles.
EGHAM.—Extensions to Isolation Hospital for the U.D.C.; the Clerk.
ELLESMERE PORT.—New labour hall for Trades and Labour Council.
ENNISKILLEN.—Cottage hospital at the Royal School; Secretary, Portora War Memorial Committee.
ESTON (Middlesbrough).—Houses for the U.D.C.; surveyor. Premises, Ann Street, for the Co-operative Society; the secretary.
FARSLEY (Yorks.).—Garage at Stanningley Hall for Wilson Lodge.
FAVERSHAM.—Extensions, West Street, for Timothy White Co., Ltd., chemists, Portsmouth.
FIFESHIRE.—School at Rosyth (£35,000); R. H. Motion, architect, Dunfermline.
FLEETWOOD.—Additional warehouses; L. & Y. Ry. Co., Hunt's Bank, Manchester.
GATESHEAD.—Bakery for the Gateshead Co-operative Society, Ltd.; Architect's Department, C.W.S., West Blandford Street, Newcastle-on-Tyne.
GLASGOW.—Picture house, 460, Lanchiehal Street; Ideal Improvement Syndicate, Ltd., London. Offices for the Lanarkshire E.C.; the Clerk, Glasgow.
GORTON.—Extensions; Beyer, Peacock & Co., Ltd., engineers.
HEMSWORTH (Yorks.).—Conversion of Hemsworth Hall into a secondary school for West Riding Education Authorities; Architect, Education Department, County Hall, Wakefield.
HENLEY-ON-THAMES.—Houses for the R.D.C.; Willcox & Greenaway, architects, 11, Friar Street, Reading.
HEXHAM.—Houses, &c., Hexhamshire Estate, for Northumberland C.C. (£30,000); A. P. Ker, County Land Agent, Moot Hall, Newcastle-on-Tyne.
HIRWAIN (Aberdare).—150 houses for the Vaynor and Penderyn R.D.C.; F. T. James, clerk, 134, High Street, Merthyr Tydfil.
HOOLE (Chester).—Council Chamber and Offices, 160 houses, for the U.D.C.; F. Davies, architect, 14, Newgate Street, Chester.
HUDDERSFIELD.—Extension of Britannia Works for J. Hopkinson & Co., Ltd., Crosland Moor; J. Ainley, architect, 3, Chapel Hill.
HULL.—Reinstatement factory and warehouse, Queen Street; T. J. Smith & Nephew.
KILMARNOCK.—Alterations to 38, John Finnie Street for Lymburner & Bryson, tailors. Buildings for J. & M. Craig (Shanks & Co., Ltd., proprietors) (£5,000); the manager.
KIRKHAM.—Renovation of Ribby-with-Wrea Church; secretary to the Church Council.
LANCASTER.—Detached residence, Hest Bank; Jackson & Jackson, architects, 43, Church Street.
LEEDS.—Enlargement of laboratory accommodation at the University; Secretary to the Senate.
LEITH.—Alterations, Market House, Tolbooth Wynd, for Messrs. Jeffrey, drapers.
LONDON, W.C.—Extensions at the Cosmo Hotel, Southampton Row, for Cosmo Hotel (London), Ltd. M. Vincent, Managing Director.
(Bermondsey, S.E.).—New baths and wash-houses; Borough Surveyor.
(Stratford, E.).—Additions to Central Secondary School; J. H. Jacques, architect, 2, Fen Court, Fenchurch Street, E.C.
MANSFIELD.—Premises, Bancroft Lane, for the Mansfield and Sutton Co-operative Society, Ltd.
RAINFORD (St. Helens).—Houses for the U.D.C.; Biram & Fletcher, architects, George Street, St. Helens.
RICHMOND-ON-THAMES.—Additions to Devonshire Lodge, Petersham Road; E. J. Partridge, architect.
RICKMANSWORTH (Herts.).—52 houses for the U.D.C.; S. Dawe, architect, High Street.
RUFFORD (Mansfield).—150 houses for the Southwell R.D.C.; the clerk.
RUSHDEN (Northants.).—42 houses for the U.D.C.; the surveyor.
ST. HELENS.—Glass works extensions; Pilkington Bros.
SACRISTON (Co. Durham).—Probable rebuilding of Daisy Hill Co-operative Stores, Witton Gilbert (damaged by fire, £40,000); General Manager.
SILSDEN (Yorks.).—Council school, Hothfield Street, for W.R. County Council; Education Architect, Wakefield.
SLOUGH (Bucks.).—Motor body works, Wexham Road, for the Motor Transport Co., Ltd.
SOUTHAMPTON.—New Taunton School for the Borough E.C.; the Clerk.
SPENNYMOOR (Co. Durham).—Enlargement of school, North Road; A. J. Dawson, Director of Education, County Education Offices.
STAFFORD.—New church in Weston Road, adjoining Littleworth School; Rev. J. R. Lumb, priest-in-charge, St. John's Church.
STOCKTON-ON-TEES.—Brickyards, Grange Farm, for R. Blackett & Sons, Darlington.
STOKESLEY.—Tuberculosis sanatorium for West Hartlepool and Middlesbrough T.C.s.
STOURBRIDGE.—Premises, Hagley Road, for A. Orford. Additions to the Plough Hotel, Wollaston, for Mitchells & Butlers, Ltd., Oldbury. Workshops and stores, Green Street, for E. Baylie & Co., Ltd.
STRATFORD-ON-AVON.—Reconstruction of premises, 17 and 18, High Street, for the T.C.
SWANSEA.—Saw mills, &c., East Dock, for John Lewis & Co. (£90,000).
THORNTON.—School, for the East Riding of Yorks E.C.; J. Bickerateth, clerk.
TRURO.—Houses for the T.C.; the Surveyor.
WAKEFIELD.—Addition to Albion Mills, Horbury Bridge; Marriott, Son and Shaw, Church Street Chambers, Dewsbury.
WALKDEN.—Bank premises (junction of Bolton Road and Manchester Road); managing director, Union Bank of Manchester.
WALTON-LE-DALE.—Workshops in Moon Street, Bamber Bridge, for J. Seed.
WARRINGTON.—Extensions; Dallam Forge Co.
WATFORD.—Box factory, Delectaland Works, for the Watford Manufacturing Co., Ltd.
WENDOVER (Bucks.).—30 houses; T. E. Theakeston, architect.
WESTHOUGHTON.—Maternity and child welfare centre; surveyor to U.D.C.
WHITBY.—Salvage works at Spital Bridge; Surveyor to U.D.C.
WINDSOR.—Alterations, &c., 5, 7, and 9, Sheet Street, for Burfoot & Son.
WITHNELL (near Chorley).—Club premises (£2,000); Secretary, Discharged Soldiers' Federation.
WOBURN SANDS (Beds.).—Saw mills, for the Kensington Timber Co.
WOODSTOCK (Oxon.).—Houses, for the T.C.; H. J. White, architect, 21, Staverton Road, Oxford.
WORSLEY.—Rebuilding at Worsley New Hall; Lord Ellesmere.
WREXHAM.—Alterations, &c., to the Wynnstay and Blossoms Hotels, for Bent's Brewery Co. Labour Exchange premises (£20,000) for the Ministry of Labour.
YORK.—Reinstatment St. Maurice's Church, Monkgate; the Vicar.

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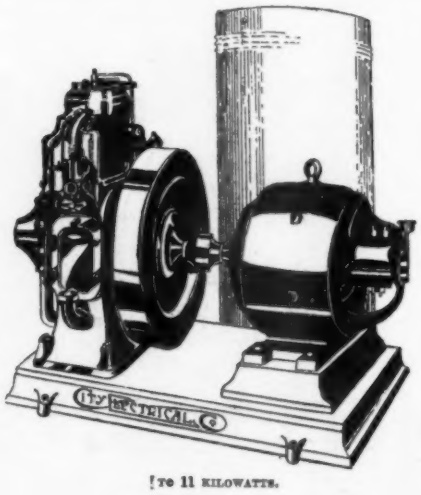

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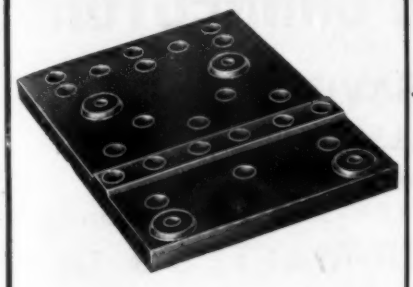

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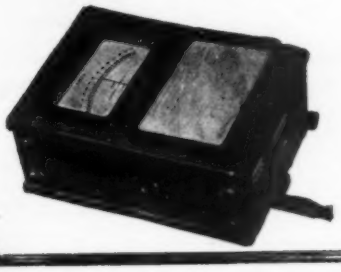

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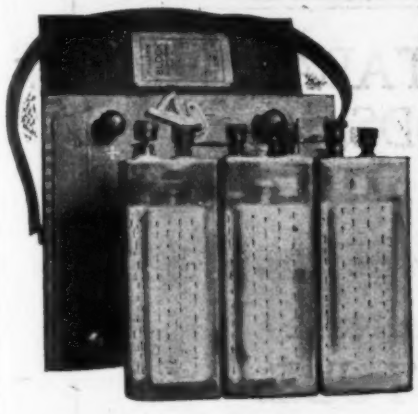

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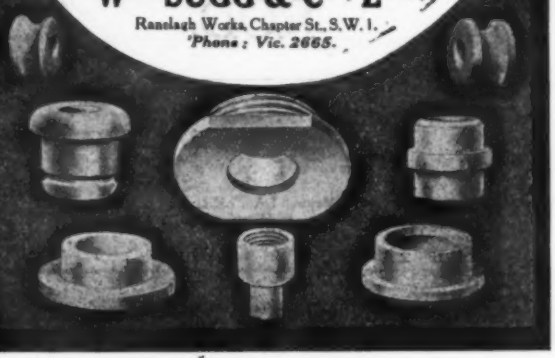

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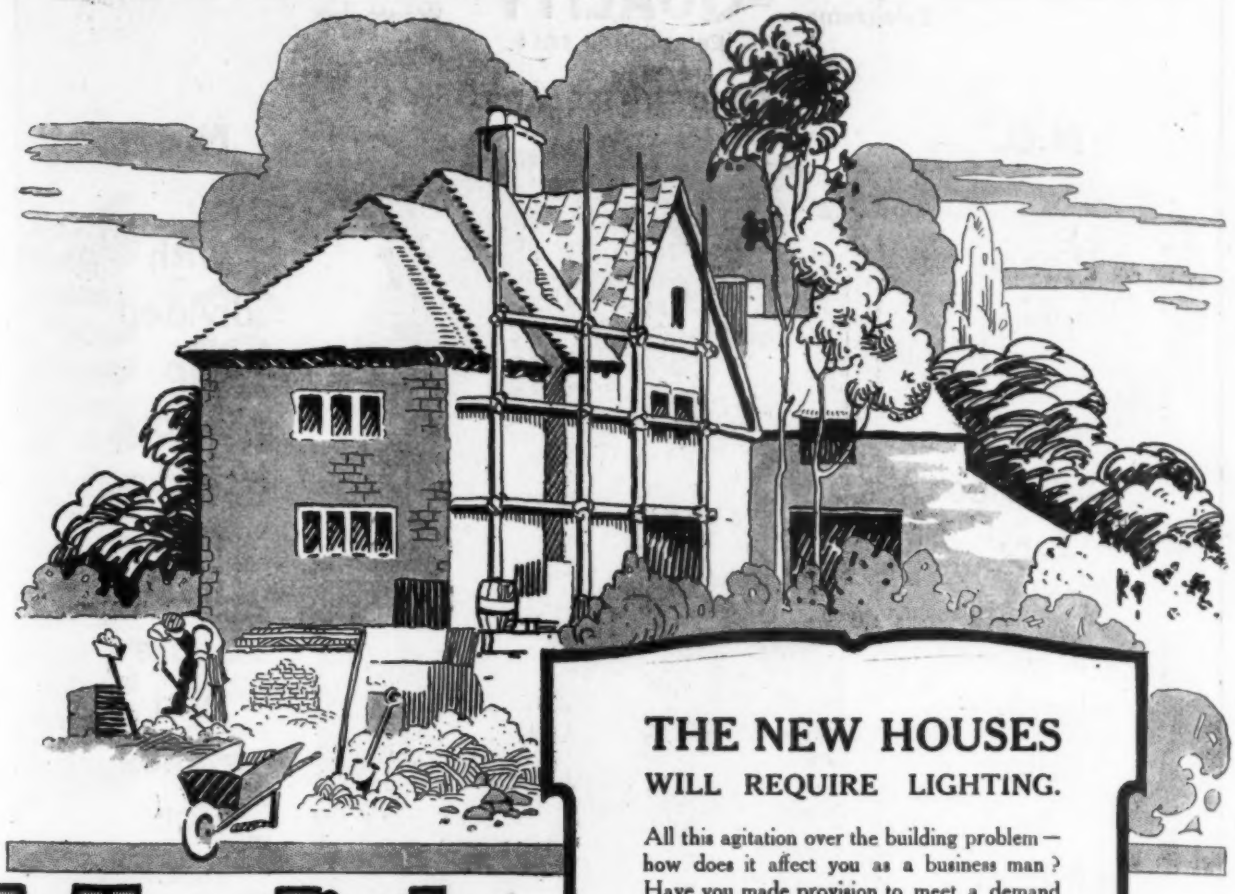

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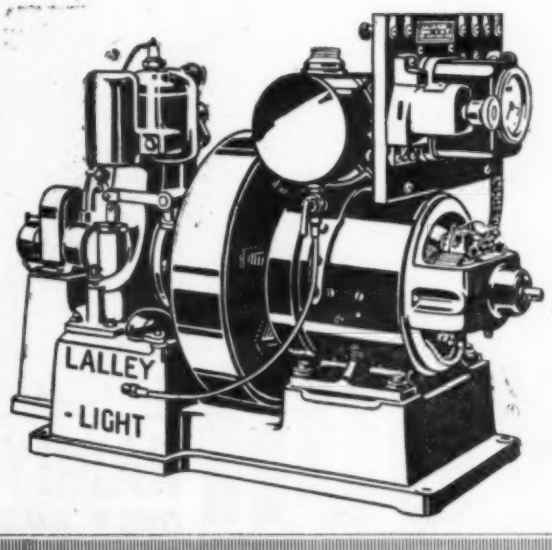

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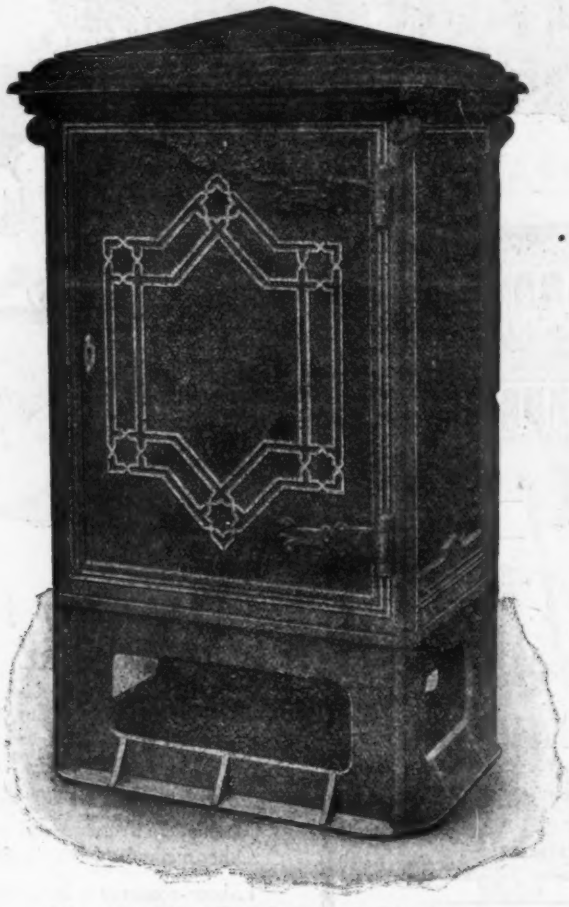

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,, 2a	21 × 16 ins.	33 × 17 ins.
,, 2c	21 × 18 ins.	33 × 17 ins.
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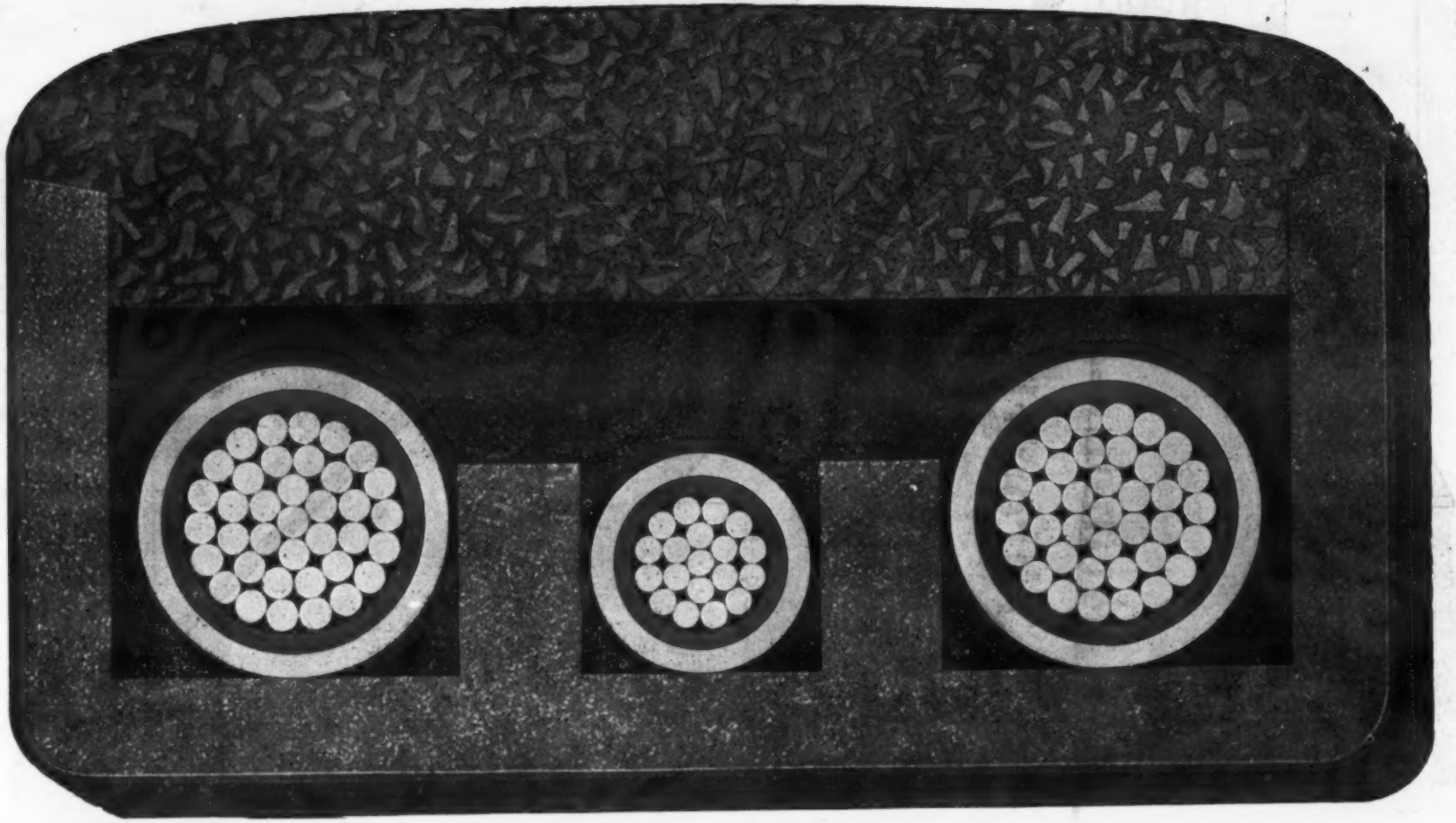

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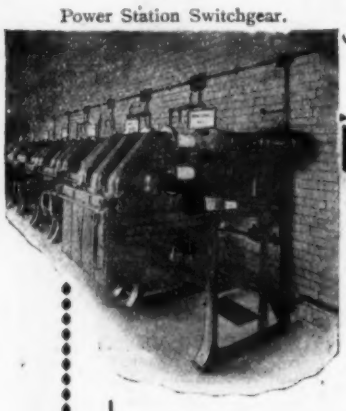
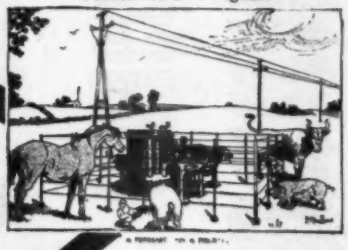


Substation Switchgear.



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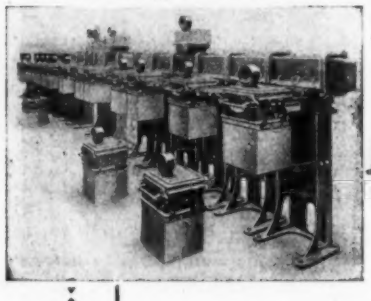

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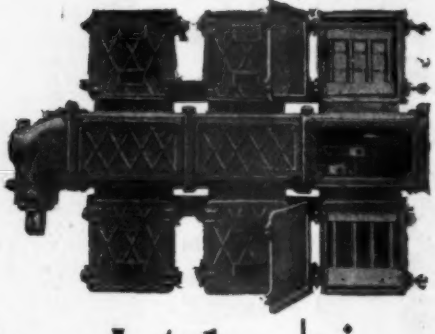

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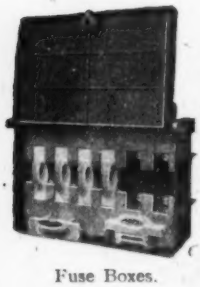

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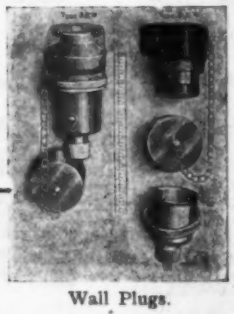

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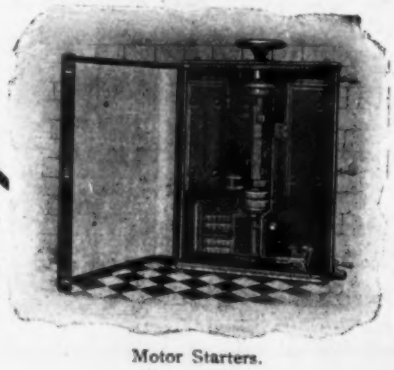

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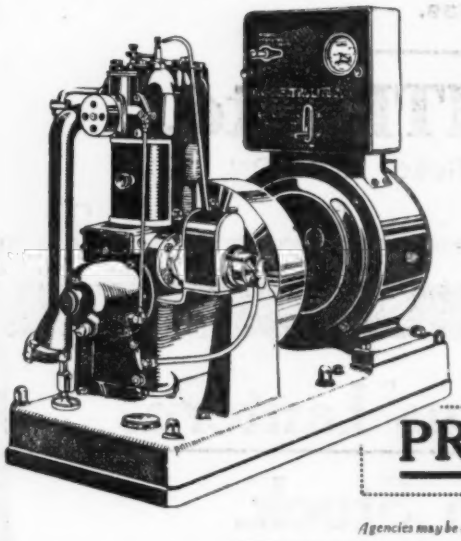

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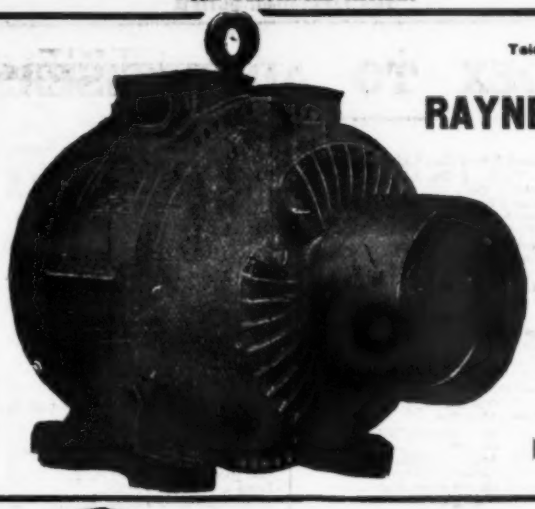

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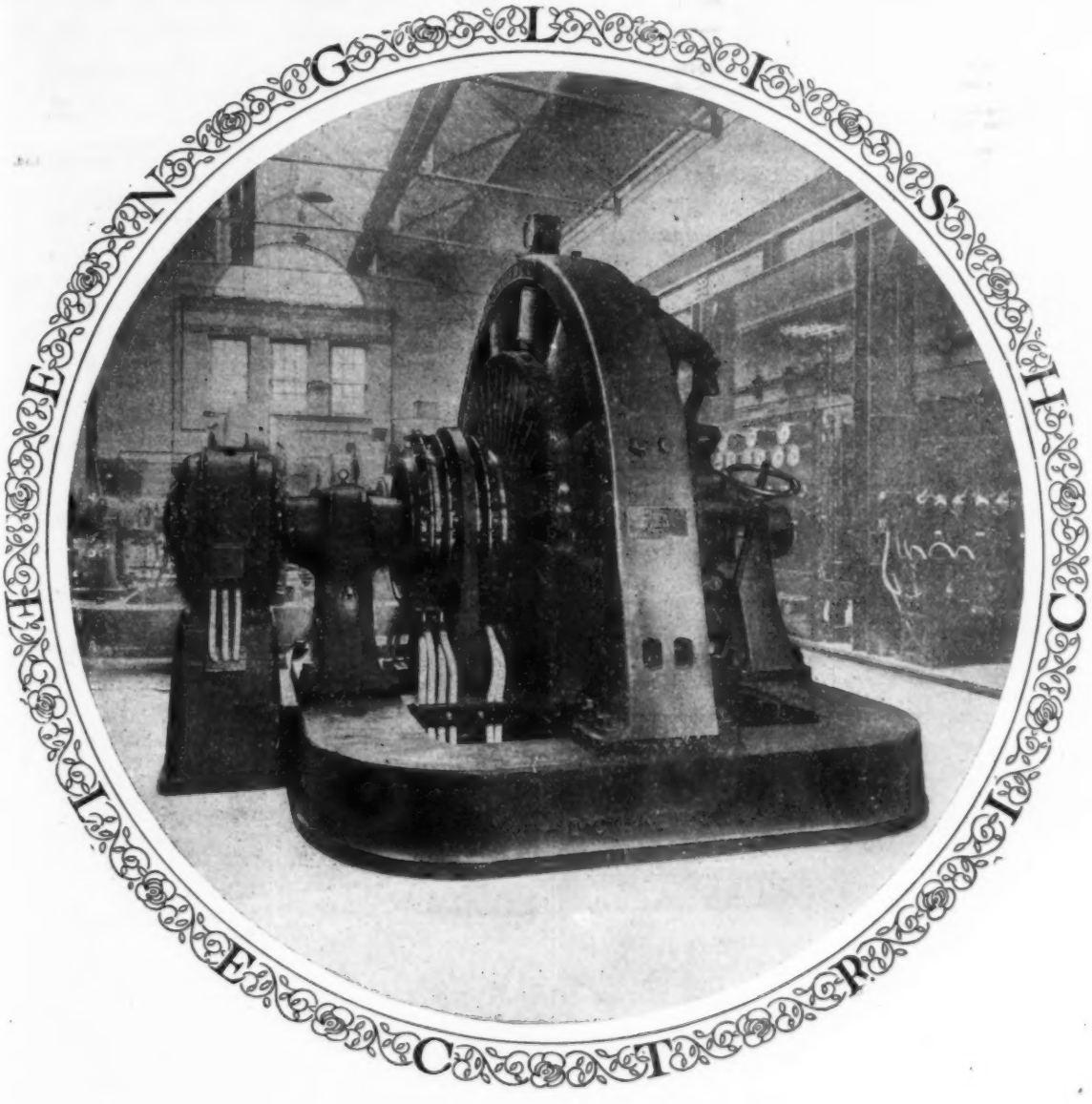

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Relating to Situations, Articles for Sale and Wanted, &c., appear on Sup. 15, &c.

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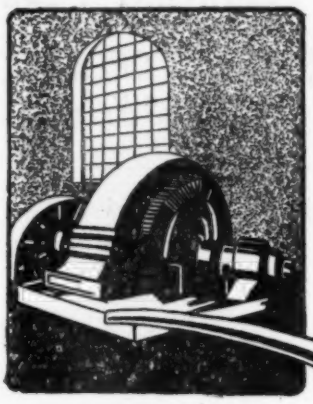

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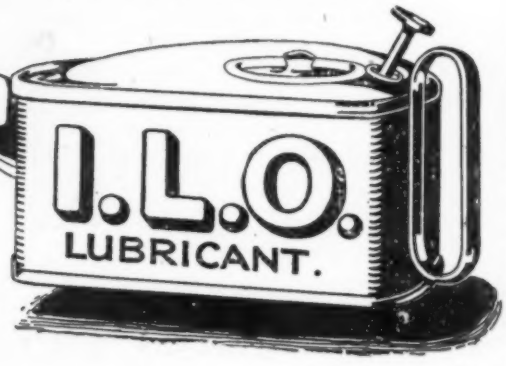

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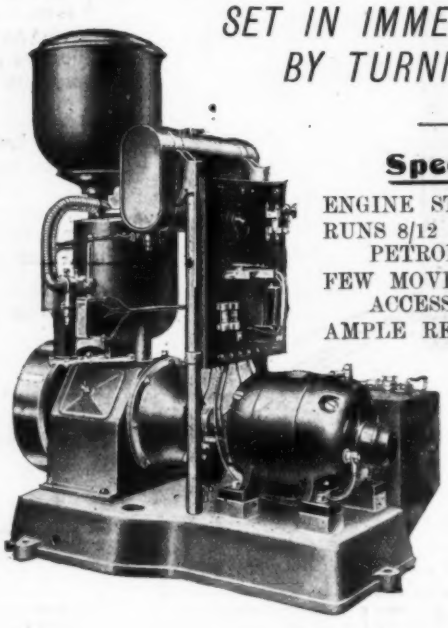

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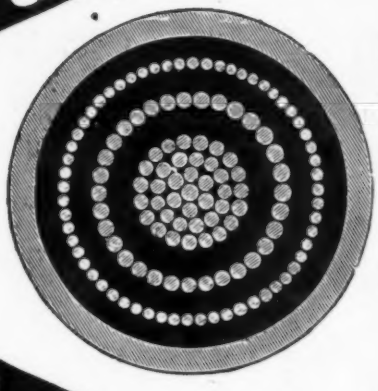

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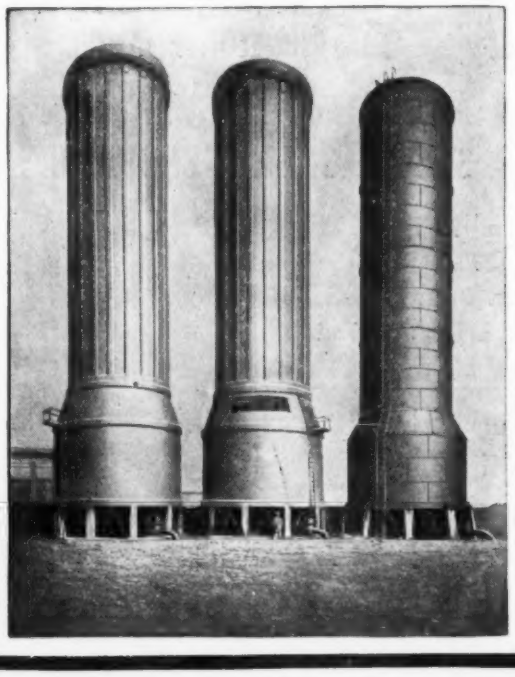

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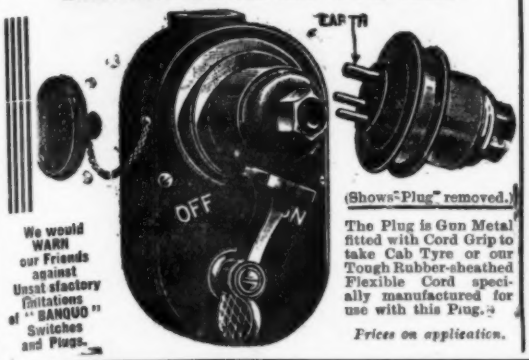

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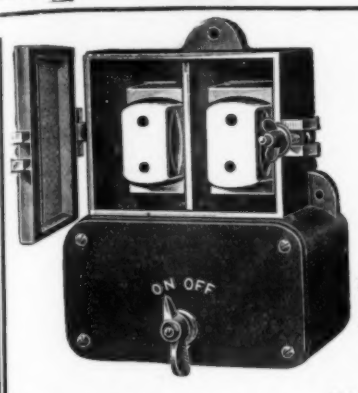

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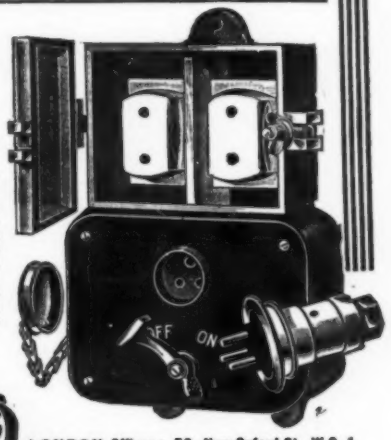

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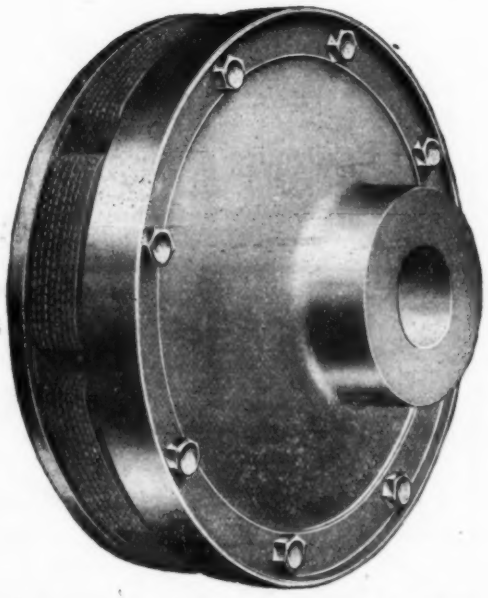

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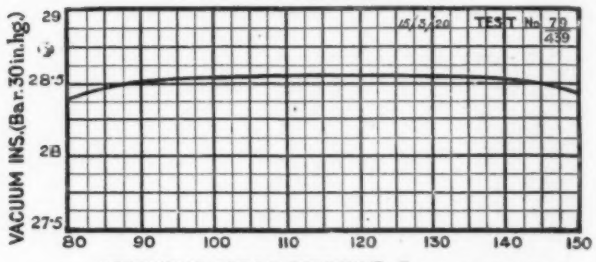

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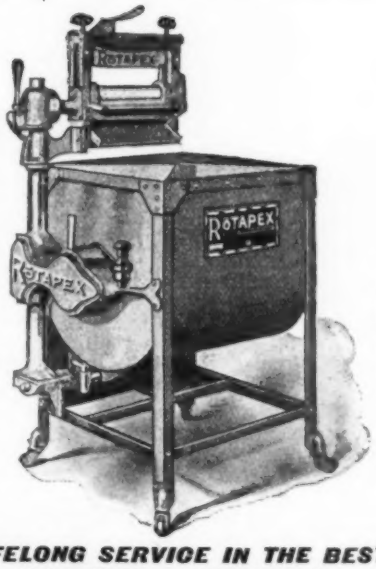

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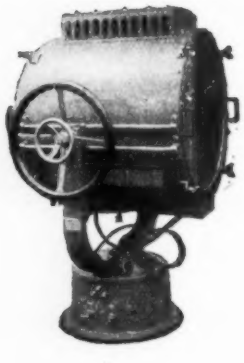

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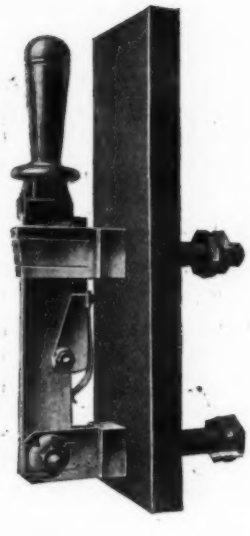
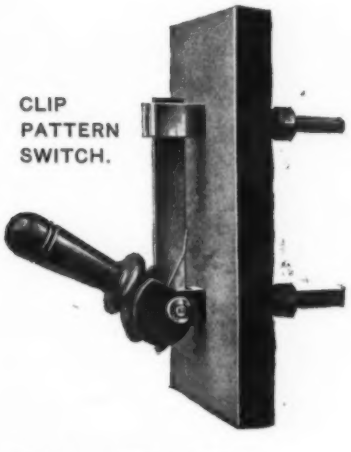


KNIFE PATTERN SWITCH.



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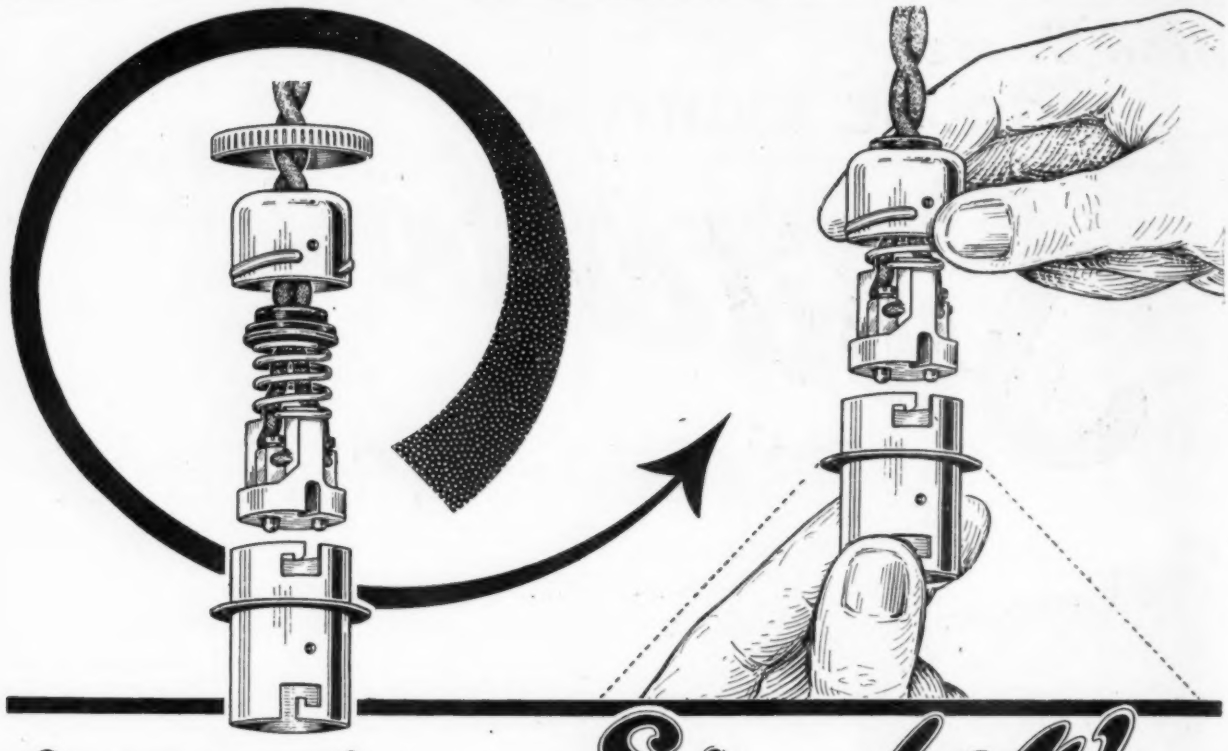

'LESCO'-the Simple Way

The LESCO Lampholder ensures a big saving in time and trouble and makes for the STRICTEST ECONOMIES IN EVERY DIRECTION.

Its simplicity will instantly appeal to the practical man and a "two minute" examination disclose its pronounced superiority over every other holder.

Reference to the detailed sketch at top of page will emphasize this note of LESCO Simplicity and help you to more fully appreciate the following list of advantages:—

Easily and quickly assembled—simplifies and facilitates fitting and SAVES 50% in wiring time.

Has a single REVERSIBLE Shade-Locking Ring OUTSIDE, which is rapidly and securely fixed in position by a single turn.

A Real Cord Grip which needs no cutting away and will withstand a pull of 60 lbs.

No LOOSE Screwed Shade Rings to bother with, and no screw threads to get crossed and stripped.

Has a BAYONET-joint connection ONLY—no tiresome screwed-threaded parts to cause trouble and delay.

Makes a better and more reliable contact. Pressure is uniform and never varies.

If you have not seen a sample LESCO Holder we invite you to send right away for one. Ask also for fully-illustrated literature, together with prices, &c.

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25, Victoria Street, S.W.1.

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Mylan & Smith (Engs.), Ltd.,
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SCOTLAND:
A. C. Borthwick,
149, St. Vincent St., Glasgow.

Supplies of "LESCO" Holders may be obtained from The Sun Electrical Co., Ltd., and Drake & Gorham (Wholesale), Ltd., London.

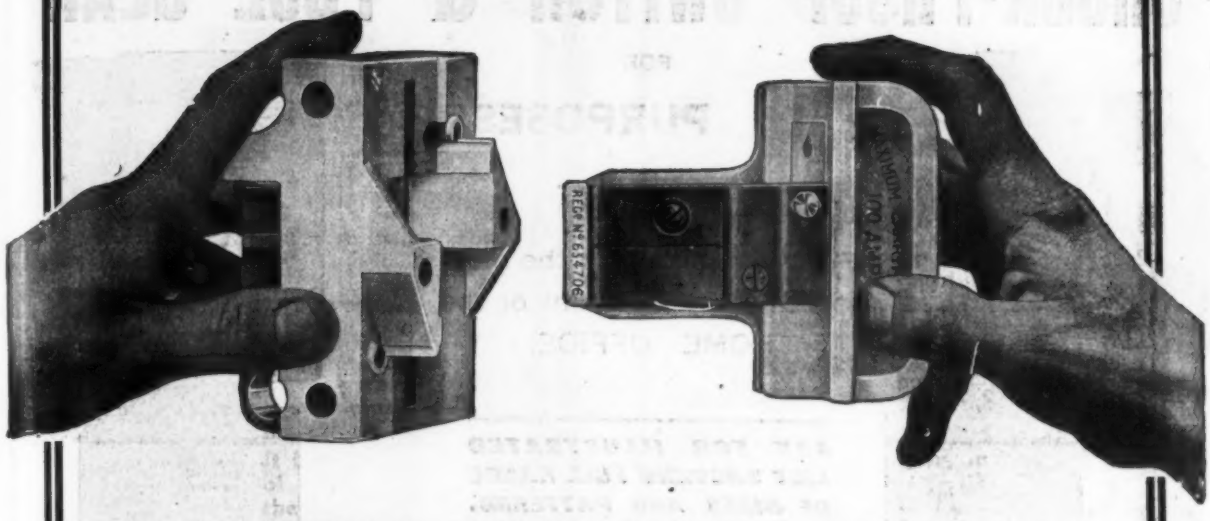
LESCO

REGD. TRADE MARK

Lampholder

(HOPE'S PROV. PATENTS)

In addition to the Cord Grip Type Holder, the "LESCO" Holder is also made in ½-in. and ¾-in. screwed types.



High in Efficiency and superior in manufacture, this Fuse fully merits YOUR investigation.

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It has many distinctive features—features which are the outcome of a wide and specialised experience—features which ensure unrivalled service.

Every part of the "FLUVENT" Fuse and Base is accurately manufactured to gauge. Any "FLUVENT" Fuse Bridge will make perfect contact in any "FLUVENT" Base.

It is of compact size and has a very short break. No portion of the actual fuse wire in the fuse is in direct contact with the china at any point.

The lining of the fuse chamber is indestructible, and will withstand 3000 deg. Centigrade.

The fuse has a perfect inverse time element.

The watts loss, and the mass of metal to be volatilised on short circuit is extremely small—watts loss less than one-fifth of that in other makes.

Fuse wire passing through small hole to contact prevents over-fusing.

Blowing effect of the tube tends to blow arc away from the contacts instead of towards them.

A complete table of fusing currents for all necessary sizes appears on the bottom of the "FLUVENT" Fuse.

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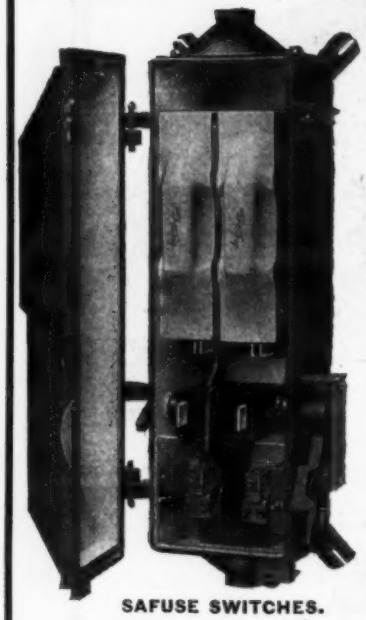
FOR

ALL PURPOSES.



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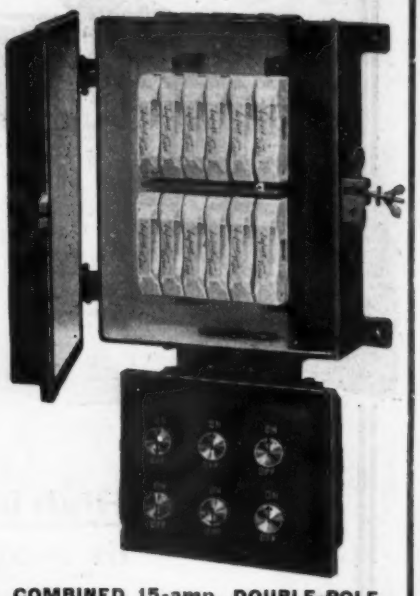

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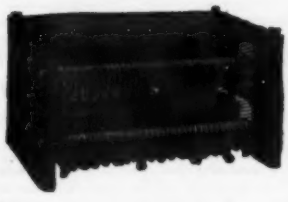

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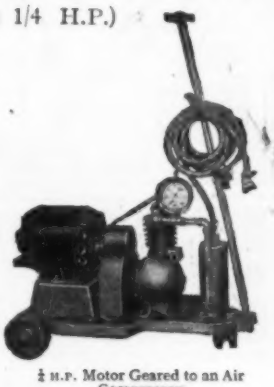
(1/10 to 1/4 H.P.)

so as to protect it when carrying full load—and that fuse will usually be of ample capacity to enable it to successfully start full load.



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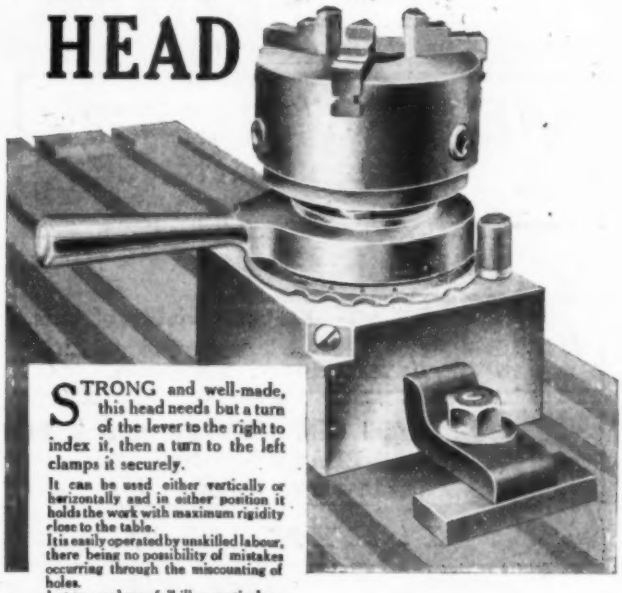
HARPER

AUTO-INDEX

HEAD



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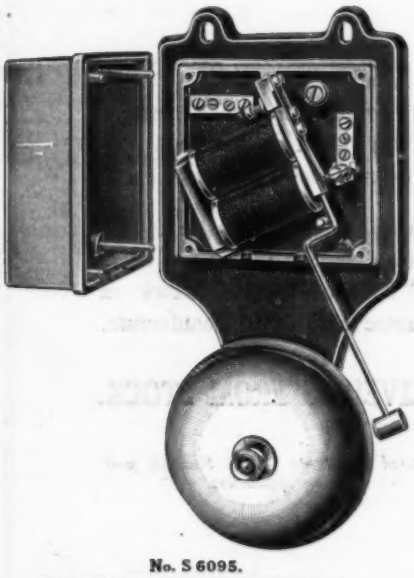

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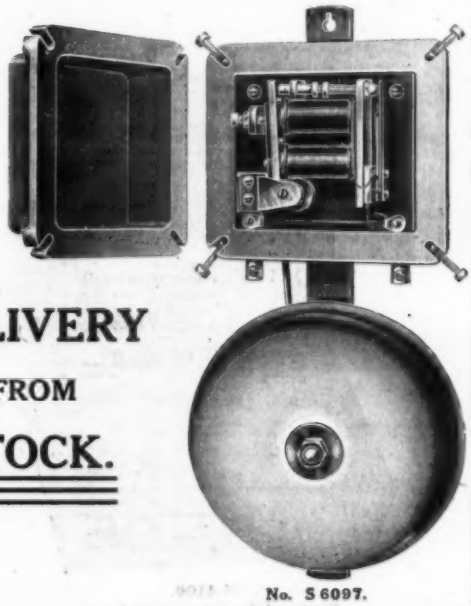

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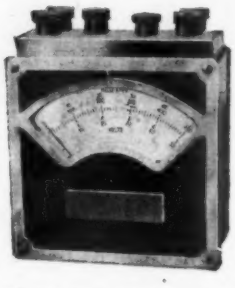

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BY DIRECTION OF THE DISPOSAL BOARD
(Plant and Machinery Section).

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Fifty-seven 10 cwt. Hand Travelling Cranes, 12-16 ft. spans, by Vaughan.
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20 miles various size Cable from 3-bore Armoured to V.R. 3/20.
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WHEATLEY KIRK, PRICE & CO.

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75 MILES OF VARIOUS CABLE—1/16, 1/18, 1/20, 1/18 twin, 3/20, 7/20, 7/25, 7/18, 7/22, 19/22, 56/22, 3/22, 14/36, 36/40 (cab tyre), 1/10 (cotton covered). 37/16, 96/16 (short length), 19/14, 14/40 (cab tyre), 35/40 (cab tyre).

BELL WIRE—Cotton covered, twin, &c., ditto High Tension, Lead Covered and Telephone Cable.

About 20 miles various unbraided Cable.

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2	5-H.P.	"	"	"	"	"
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On view day previous and morning of Sale. Catalogues upon application. Tel. Hop 743. 1093

SITUATIONS VACANT.

Latest time for receiving, 5 p.m. Wednesday.

SALE URBAN DISTRICT COUNCIL.

WANTED, General Assistant for Mains, able to joint on L.T. lead-covered cable, fix and read meters and general outside work.

Assistant for Station. D.C., 3-wire system with batteries. Diesel engine experience essential.

Applications, with full particulars of experience, copies of references and wages required, should be sent to the ELECTRICAL ENGINEER, Town Hall, Sale. 808

SKILLED FIREMAN.

WANTED Skilled Fireman, used to Babcock & Wilcox Water-tube Boilers.

Particulars of experience, wages required, and when a start could be made, to be forwarded to—

BOROUGH ELECTRICAL ENGINEER.

Grey Friars' Road,
Doncaster. 1048

YORKSHIRE ELECTRIC POWER COMPANY.

APPLICATIONS are invited for the position of Mechanical and Electrical Engineer. Applicants must be capable of laying out and supervising the erection of all classes of Electrical Plant and apparatus.

Apply, stating salary required, and giving full particulars of education, training (technical and practical), and subsequent experience, to Head Office, Wellington Road, Dewsbury. 1019

SITUATIONS VACANT.—*Continued.*

INDIA.

REQUIRED for the service of the Government of India an Electrical Engineer, graded for pay, &c., as Foreman, for the new power house of the Ammunition Factory, Kirkee. Candidates should have had experience in running a Power House with three-wire, direct current distribution, overhead mains. Preference to a candidate with some knowledge of Diesel Oil Engines and Static Balancers, and with Mechanical experience.

Terms.—Engagement for five years with option of extension or permanency if approved by Government.

Salary.—Rs. 500 per month, rising by Rs. 30 p.m. annually to Rs. 580 in the fifth year. Possible increase to Rs. 650 after ten years' service. Free quarters, medical attendance, and passages out and home for selected candidate and family, if any.

Further particulars and forms of application from Director-General of Stores, India Office, London, S.W. 1. Quote S.9361. Last date for receipt of applications JULY 3rd. 1022

LOUGHBOROUGH CORPORATION ELECTRICITY DEPARTMENT.

WANTED, at once, a thoroughly experienced Meter Superintendent, capable of overhauling and testing Chamberlain & Hookham and Ferranti D.C. Ampere-hour type Meters; Chamberlain & Hookham, Ferranti, and Mordey-Fricker Prepayment Meters. Also to keep up-to-date meter records, and satisfactorily carry out the routine work of the Department. Salary £5 5s. per week, inclusive of all bonuses and awards to date. Good prospects to smart, competent man.

Apply, giving age, and full particulars of experience—

R. B. LEACH,
Borough Electrical Engineer and Manager.

Electricity Works,
Loughborough. 1021

SHIFT ENGINEER.

SHIFT ENGINEER required with good mechanical and electrical training, accustomed to the operation of Turbo-Alternators, experienced in E.H.T., 3-phase, A.C. and D.C. supply, and must have good experience in Boiler-house control. Salary (at present under consideration) £300 per annum, including all bonuses, per six 8-hour shifts per week.

Apply, giving full particulars of training and experience, with copies of testimonials, to—

THE POWER STATION SUPERINTENDENT.

The Salt Union, Ltd.,
Western Point Power Station,
Runcorn.

(This station supplies Power in bulk to The Mersey Power Co., Ltd.) 978

CHIEF ASSISTANT ENGINEER.

T. HOOD & CO., LTD., St. Stephen's Avenue, Bristol, require gentleman for above position at once.

Applicants must have first-class commercial and technical experience.

Full particulars will be sent by post. 951

OLDHAM CORPORATION TRAMWAYS.

WANTED an Armature Winder for Traction Work. Must be competent to rebuild Commutators. Standard rate of wages, plus 2s. per week.

Applications to GENERAL MANAGER AND ENGINEER, Corporation Tramways, Oldham. 1020

SHIFT ENGINEER (RELIEF).

WANTED, Shift Engineer (Relief) for D.C. Station, Babcock Boilers, able to do small repairs. Wages £4 2s. per week (inclusive).

Reply, stating age, experience, and copies of three testimonials, to 1052, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

JOINTER.

WANTED, Jointer, used to House servicing. D.C., 3-wire system. Rate 1s. 11d. per hour.

References to ENGINEER AND MANAGER, Pontypridd Urban District Council's Generating Station, Treforest, Pontypridd. 1038

WORKING ELECTRICIAN.

WANTED Working Electrician in a Corporation Tramway Depôt in Yorkshire. Must be used to Lighting, Motor Circuits, and Controller work.

Apply, giving age, experience, and wages required, to 1016, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

(*Continued on next page.*)

SITUATIONS VACANT.—*Continued.*

BOROUGH OF WREXHAM.

Appointment of Electrical Engineer.

THE CORPORATION invite applications for the post of Resident Electrical Engineer.

Candidates must have had experience in the working of a central station.

The person appointed will be required to devote the whole of his time to the duties of the office.

The commencing salary will be £450 per annum, inclusive of all fees and emoluments.

Where the qualifications for the performance of the duties are equal, preference will be given to the applicant who has the best record of War Service.

Further particulars may be obtained from the undersigned, to whom applications (stating age and experience), endorsed "Electrical Engineer," and accompanied by copies of not more than three testimonials, must be delivered no later than 12 noon on MONDAY, JULY 12th, 1920.

Canvassing, either directly or indirectly, will disqualify, but Candidates are at liberty to send copies of their applications to members of the Council if they so desire.

LAWSON TAYLOR,
Town Clerk.

Guildhall, Wrexham.
June 22nd, 1920. 1109

SHIFT ENGINEER.

Mains and Meter Assistant.

SHIFT ENGINEER required for D.C., 3-wire Poder Station; 1,000-KW. Gas Plant in use, and 2,000-KW. Steam Plant being installed. Good electrical technical training and experience operation high speed engines and water-tube boilers essential. Experience large gas engines desirable.

Also assistant required for Mains and Meter Department, capable of locating faults in Mains, maintaining apparatus in consumers' premises, and testing meters. Good electrical knowledge essential.

Applications, for both appointments, stating full particulars of experience, qualification, age, wages required, and when free to start duties, to ENGINEER AND MANAGER, Corporation Electricity Works, Alloa. 1098

TANGANYIKA TERRITORY.

TELEGRAPH SUB-ENGINEER required for service in the Posts and Telegraphs Department of the Tanganyika Territory for a period of from 20 to 30 months, with possible extension. Salary £300 rising to £350 by annual increments of £15. Quarters free of rent, and free passages and liberal leave in England on full salary.

Candidates, age between 23 and 40, should possess a technical and practical knowledge of telegraphy and telephony, instruments, line construction, maintenance, including survey and estimating for new lines, should understand control of labour; experience in engineering department of British Post Office preferred, or Colonial experience in similar position.

Apply at once by letter, stating age, whether married or single, and full particulars of experience, to the Crown Agents for the Colonies, 4, Millbank, London, S.W. 1, and quoting M/9571. 1126

CITY OF BIRMINGHAM EDUCATION COMMITTEE.

REQUIRED in September next the full-time services of Lecturers in the following subjects:—

MUNICIPAL TECHNICAL SCHOOL (Principal: W. E. Sumpner, D.Sc.).

Physics, Electrical Engineering, Mechanical Engineering.

HANDSWORTH TECHNICAL SCHOOL (Principal: W. E. Harrison, A.R.C.Sc.).

Mechanical Engineering.

The commencing salary offered will depend upon the previous training and experience of the candidates.

For full particulars apply to SECRETARY, Municipal Technical School, Suffolk Street, Birmingham, specifying post in respect of which particulars are required. 896

MANAGER.

FIRM manufacturing Transformers requires services of experienced Engineer for above position. Must have works experience and be up to date in Transformer design.

Apply, stating experience and salary required, to 1111, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

CABLE JOINTER.

CABLE JOINTER wanted for three-wire network. Experience with low-tension triple-concentric feeder cables and V.B. distributors laid solid, with service work thereon.

Full particulars to be sent to the CORPORATION ELECTRICITY WORKS, Perth, stating age, experience, and when able to commence duties. 1118

SITUATIONS VACANT.—*Continued.*

ENGINEER.

WANTED to take charge of a shift, technically trained Engineer with experience of high pressure Boilers, Turbo Generators, and E.H.T. 3-phase Switchgear. Hours 48 per week. Salary at the rate of £169 per annum, plus 20 per cent., plus £120, total £322 16s.

Apply, in own handwriting, stating age, present salary, and particulars of training, to THE GENERAL MANAGER, Electricity Offices, Dunning Street, Sunderland. 1107

ELECTRICAL POWER ENGINEERS' ASSOCIATION.

Yorkshire Electric Power Co., Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board.

ALL ENGINEERS, before accepting any position on the Staffs of either of the above undertakings, are recommended to communicate with the undersigned.

W. ARTHUR JONES,
General Secretary.

65-66, Chancery Lane,
London, W.C.2. 6666

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ARMATURE Winders wanted, Experts on A.C. and D.C. repairs only need apply. Fare paid. Must be Trade Unionists. Permanent employment. State experience.—McWhirter & Sons, Ltd., Cardiff. 463

ARMATURE Winders Wanted; men experienced in D.C. and A.C. Machines.—State experience and wages required.—Cranmer Brown, Ltd. 9, Wellington Street, Hull. 1050

ARMATURE Winders, several wanted, used A.C. and D.C.—W. Canning & Co., Ltd., Salop Street, Highgate, Birmingham. 1025

ASSISTANT Engineer-in-Charge required for a London power station. Apply giving full particulars of training and experience, stating age and salary required.—1076, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT Estimator wanted to deal with enquiries for switchgear, motors and plant generally. Must have sound technical knowledge and have had commercial experience in a similar capacity.—Reply, stating age, experience and salary required to 1128, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANTS wanted, with some knowledge of A.C. and D.C. design, for estimating, engineering and contract departments. To be capable of preparing tenders, carrying on technical correspondence, &c. State age, experience and salary required.—Apply Secretary, Lancashire Dynamo & Motor Co., Ltd., Trafford Park, Manchester. 1018

CALIBRATORS.—Vacancies for Instrument and Meter Calibrators with technical knowledge, in electrical engineering works in Manchester district.—State experience, technical training and salary required, to 984, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COLLIERY Electrician wanted immediately, complete charge of small plant, 12,000 volts and 3,300 volts A.C., capable of small repairs, wiring, erection of motors, telephones, and experience in mines.—State experience, wages, capabilities, and references, &c., 3454, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DESIGNING Engineers wanted for Transformer work by electrical manufacturing firm. Those with previous experience of this class of work preferred, but other applications from capable men will be considered.—State age, experience and salary required, to 1071, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN wanted for switchgear factory, Midlands.—Write, stating fully experience, age and salary required, Box 110, Sells, Ltd., 167, Fleet Street, E.C. 3555

DRAUGHTSMEN (senior) required with sound mechanical general knowledge and shop training; preference given to those with cement works' experience.—State age, experience and salary required, to Box 1211, Willings, 125, Strand, W.C. 2. 971

DRAUGHTSMEN.—Wanted by firm in Manchester district, Senior Mechanical Draughtsmen, for electrical department. Experience of transformer work an advantage. Permanent positions.—State age, previous experience and class of work, and salary required, to 983, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer wanted for the Switchgear Department of an engineering firm in the Manchester district. Must be fully conversant with high capacity modern electrical systems. Applicants should state experience, technical training and salary required, to 1070, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

ELECTRICAL Engineers require spare time assistance of gentleman in touch with electric light or power users in any of the London areas.—3723, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Lamp Maker required at once to increase present small output and to take over the management of works, must be practical, fully capable and experienced in all details, machines and pumps necessary to lamp works management and lamp making. Capable organiser of staff and teacher of apprentices, good progressive position for the right man. Reply stating age, details of experience, where last or at present employed, replies treated strictly confidential.—3658, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN (Foreman), to take charge of electrical plant in large works in Midlands. Must be well up in A.C. and D.C. work.—State experience, age and wages required, to 1010, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIANS wanted, suitable for complete plant installations; London rate paid to first-class men.—W. Watts & Co., Engineers and Contractors, 31, Carlton Chambers, Newport, Mon. 3519

ENGINEERS wanted. Knowledge manual telephone exchanges and apparatus design. Opportunity of becoming familiar with automatics. Permanent position with superannuation Large factory in the North.—925, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ESTIMATING Clerk required, with thorough knowledge of electrical supplies business, good opening for the right man, London appointment.—Write, stating age, experience, salary required, to 1123, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ESTIMATING Engineer required with technical knowledge of A.C. and D.C. machines. Previous tendering experience essential.—Apply by letter, stating qualifications, age and salary, to General Electric Co. Ltd., Witton, Birmingham. 1092

ESTIMATOR required for telephone works. Knowledge of modern machine and assembly shop methods on mass production, raw material calculation, drawings, &c. Permanent progressive position for the right man. State age, experience in full and wages required.—Peel-Conner Telephone Works, Ltd., Adelphi, Salford. 1024

FIRST-Class Senior Transformer Draughtsman required for London district.—1081, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

INSTALLERS (several) wanted for manual telephone exchange work. Opportunity later of gaining experience in the erection of automatic telephone exchanges for home and abroad. Also Power Men. Factory in the North.—924, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

JUNIOR Draughtsman required for Manchester district (later Coventry). Preferably man with experience in telephone switchboard equipment work.—Reply stating age, experience and salary required, to 153, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

JUNIOR Engineer with technical college or university training in electrical engineering, knowledge wireless advantage, required on engineering staff large cable contractors for training in latest development of telephone cable testing and balancing, willing to travel in provinces, good opportunities for right type of man. Give full details of experience and qualifications. Commencing salary £3 per week, and travelling allowances.—1103, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

LAD, used to electrical stores and shop, required.—C. J. Ferguson and Sons, 54, Chiswell Street, E.C. 1085

LADY Shorthand Typist, thoroughly experienced and accustomed to electrical contractor's work. London. State age, experience, salary.—1014, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

LEAD Press.—Foreman or Chargehand wanted for large works in South. Only competent men need apply.—Full particulars to 1083, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MECHANICAL Engineer for small factory, to take charge drawing office, also to supervise design and manufacture press tools and jigs.—Write stating age, experience and salary required, to British Thomson-Houston Co., Fittings Factory, Lower Hillmorton Road, Rugby. 785

REPRESENTATIVE required, for London and near suburbs, by leading manufacturer of electric lamps, fittings, accessories, &c. Must have up-to-date knowledge of the business. Salary and expenses only.—Write, stating age, experience and salary required, to 1124, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

REPRESENTATIVES wanted in various counties in the U.K. for the sale of vulcanised rubber insulated wires and cables. Good commission.—Apply, with full particulars, to 1026, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

REQUIRED Induction Motor Tester, with good technical training and practical experience. Able to trace diagrams and connect up stators and rotors. State age and salary required with full details of experience. For West Riding of Yorkshire.—3654, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

SHIFT Engineer required for small D.C. Traction and Lighting Station. Must be fully experienced with vertical and Horizontal steam engine and boiler room supervision. Write enclosing copies of references, state age and wages required for 48-hour week.—Grimsby Tramways Electricity Works, Cleethorpes, Linc. 1044

SWITCHGEAR and Switchboard Improvers required, small factory North-West London.—Apply, stating age, salary required and full previous experience, to 3667, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TELEPHONE Draughtsman required for London office, used to circuits, manufacturing and exchange detail.—Application by letter only, stating age, experience and salary required, to the Relay Automatic Telephone Co., Ltd., Marconi House, Strand. 3747

TELEPHONE Draughtsmen.—We have vacancies for a number of experienced Telephone Draughtsmen for large common battery, exchange equipment work. We have built and are now opening a telephone factory in the Midlands several times larger than our present one. This means increased staff and increased rate of promotion. To capable men advancement to positoins as engineers is quite certain in the near future.—Reply, stating full particulars, to Peel-Conner Telephone Works, Ltd., Adelphi, Salford. 1023

TELEPHONE Switchboard Wireman and Mechanic wanted, accustomed to overhauling C. B. and magneto boards. S.E. London district.—State experience and wages required to 1037, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TEST-Room Assistant required with some experience in testing of motor control gear.—Apply, stating age, experience and wages required, to The Electrical Apparatus Company, Ltd., Vauxhall Works, South Lambeth Road, London, S.W. 8. 3750

THE United Alkali Co., Ltd., invite applications for the position of Charge Engineer at West Bank Power Station, Widnes. Salary £300 per annum, inclusive of all bonuses; 48 hours per week, shift working.—Applications, stating age, full particulars of training, and experience with E.H.T., 3-phase, turbo-generators, and water-tube boilers, and enclosing copies of references, to the Chief Engineer's Office. Widnes. 928

TRANSFORMER Draughtsmen required immediately. Good salaries to experienced men.—Apply Johnson & Phillips, Ltd., Charlton, S.E. 7. 1084

TWO Junior Charge Engineers required for small generating station, D.C. system, reciprocating engines, water-tube boilers.—Apply, stating age, married or single, together will full particulars of past experience, 3721, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, a Sub-station Attendant for a London sub-station with a plant capacity between 1000 and 3000 kilowatts.—Apply, giving full particulars, 3697, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, a Youth as Junior Assistant in the Mains Department of a large undertaking, one having some electrical technical knowledge and some experience on electric mains preferred. Salary £150 per annum, inclusive of all bonus awards to date.—Apply, with full particulars, to 1072, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, A.C. Armature Winders skilled on general repair work. Only first-class men need apply. Fares paid.—Western Engineering Co., Swansea. 9135

WANTED, by a firm manufacturing electric heating and cooking apparatus, a Gentleman, energetic and tactful and experienced in travelling, as outside representative to introduce these goods amongst users.—929, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Draughtsman for electrical works in Manchester making light switch and fuse gear, switchboards, &c. Must be also capable of estimating costs. Good prospects for capable and energetic man.—962, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Electrical Engineer, with ability and experience of works power equipment and transmission, for consulting engineer's office. State qualifications and experience, age and salary required.—3692, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, experienced Wireman for house and factory work. Good prospects for really capable man. Others need not apply.—Midland Dynamo Co., Ltd., Leicester. 1027

WANTED, for central station, experienced Armature Winder; man with some installation experience preferred.—1116, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, for Manchester district, Assistant Mains Engineer, accustomed to E.H.T. and L.T. distribution, A.C. and D.C., able to take particulars of and record cable routes.—Apply, stating age, experience and salary required, with copies of testimonials, 947, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED for South Yorkshire district, good steady Electrician, used to A.C. and D.C. lighting, and motors, bells, telephones.—Apply, stating age, experience, &c., 3676, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(*Continued on next page.*)

SITUATIONS VACANT.—*Continued.*

WANTED, several Armature Winders, used to A.C. and D.C. work; Standard rate paid, plus 12½%. None but first-class men need apply.—6780, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, young outdoor salesman with live connections amongst garages and electrical engineers. Preferably with accumulator experience.—Apply, Fuller's United Electric Works, Iddesleigh House, Westminster. 1028

WIREMAN wanted. Must be fully experienced in all systems house wiring. Permanency to suitable man.—State full details to 3646, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

APPOINTMENTS FILLED.

Dissatisfaction having been so often expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that advertisers notify us to that effect when they have arrived at a decision. We will then insert a notice free of charge under this heading.

BOX 2436 (Junior Mains Assistant); Box 880 (Dynamo Tester); Box 791 (Electrical Fitter); Box 191 (Assistant for Experimental Work); York Electricity Generating Station (Shift Engineer); Freeman & Co., Dudley (Electricians); Box 584 (Accumulators); Box 980 (Youth); Box 981 (Town Traveller).

SITUATIONS WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A.A.A. Electrical Engineer (28), 11 years' experience in modern electric practice, factory and works installations, showroom contracting and commercial experience, accustomed to handling men, desires position as Assistant Engineer in factory or contracting business, London district preferred, but not essential.—3655, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A.A.—An Electrical Engineer desires change, at present in control of electrical contracting business; first-class practical and technical experience in lighting, heating and power, good knowledge of lifts and country house installations, well up in estimating, interviewing and supervising. Man with sound ideas and initiative. To a progressive firm would be a sound investment.—3628, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A.M.I.E.E., A.M.I.Mech.E., Electrical Engineer (37) at present chief electrical engineer and manager of a large undertaking abroad, at liberty at the end of July, desires position at home. Design and construction of turbines, generators, expert on traction equipment. Works organisation a speciality.—3564, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A.M.I.E.E., ex-officer Indian Army, had charge offices at home and abroad, five years central station, 15 years as commercial sales engineer.—3648, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A.M.I.E.E., over 20 years' generating station, mains, running and maintenance, also power and lighting installation, erecting, &c., desires position as Electrical Insurance Inspector or charge of electric supply system.—3645, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A CHARGE Engineer requires post, A.C. and D.C. central station experience.—3528, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A GOOD all-round Electrician, also a very useful youth, wants job.—25, Victoria Street, Paddington. 3707

A RELIABLE Working Foreman, Electrician or otherwise, expert screwed conduit or casing, speciality complete interior installations town or country mansions; testimonials.—3717, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ACCUMULATORS and Dry Batteries.—Technical Managing Director of very old-established manufacturing business desires position of responsibility; 18 years' electrical and business experience. Honours Science Degree.—3510, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER seeks post Overseas; recently returned from West Africa; late general managing chief engineer light and power company; thorough practical knowledge steam, electricity and internal combustion engines and maintenance, good organiser, disciplinarian, British, fine physique, 28, married, one child, 4½ years Army, speak Portuguese, Spanish.—S., 26, Harbut Road, S.W. 11. 3672

ADVERTISER wants situation as Improver; three years' general electrical experience and armature winding previous to two years in Air Force.—3686, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER, with four years' experience in India, seeks appointment abroad, India or Mesopotamia preferred; 16 years' experience in the electrical profession.—3465, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER (young), six years' central station, two years' mechanical workshop practice, with good technical knowledge, Stud. I.E.E., desires Junior Engineership or Switchboard Attendantship with prospects of same. Would work loyally and conscientiously under engineer who would take interest in him in return.—3681, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS WANTED.—*Continued.*

ADVERTISER, 10 years' experience, electrical and mechanical, good knowledge of petrol and paraffin plants, technical training, desires responsible position under engineer. Would take charge of estate lighting plant. Conscientious, energetic and capable. Excellent references; married.—F. R., Girtford Manor, Sandy, Beds. 3595

ADVERTISER, 20 years' experience, charge, supervision and maintenance of plants, desires post.—3725, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER (24), late R.E. signals, experienced wireless, all systems, X-ray (hospital), thoroughly used maintenance, telegraph and telephone instruments, theoretical and practical, references good firms, desires position as Assistant, or one suitably progressive.—18, Aboyne Road, Tooting. 3533

ALL-Round Electrician; plant work, &c.; town or country.—20, Portsmouth Buildings, Webb Street, Bermondsey, S.E. 1. 3732

AMBITIOUS Electrical Engineer (28), thoroughly practical, technical, experienced design, manufacture, installation, organisation, control, specialised switchgear and controllers, desires post as Assistant to works manager. Reduced salary accepted for real opening.—3720, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AMBITIOUS young man requires situation with electrical engineers; wishing to advance in practical work; good technical knowledge and small practical experience. London district.—3472, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AMBITOUS youth (18) desires change, preferably electrical showroom. Two years assistant with wholesale electrical manufacturers. Good salesman, technical.—3680, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN Electrical Engineer Specialist in train lighting equipment design, manufacture and maintenance, including accumulators, also motor-car lighting and starting sets, desires position of responsibility, used to handling technical and commercial correspondence, also to control labour.—3741, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN Electrical Engineer with 6 years' experience in the manufacture of heavy electrical machinery, 10 years as chief electrical engineer in large Portland cement plant, and 2½ years in large power station, desires post anywhere in a livable climate, home or abroad, excellent references, age 34, married.—Apply to R. Law, 25, Park Hill Rise, Croydon, Surrey. 818

AN Electrical Engineer (28), 12 years' experience, motors, switchgear, instruments, A.C. and D.C. distribution; sound technical and practical training, thorough commercial ability; accustomed to interviewing, supervising and handling men; desires progressive position in or near London. Low salary accepted.—3444, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN Electrical Mechanic wants engagement; first-class supervisor, charge hand, power, lighting, factory, maintenance, 33 years' experience.—G., 137, Sulgrave Road, Hammersmith, W. 6. 3588

APPRENTICESHIP.—Advertiser wishes to place Youth with good London firm with view to learning higher branches; aged 16½ years; had six months' experience and passed London matriculation.—Write C.P., 4, Florian Road, Putney. 3514

AS Assistant Electrician, married, age 34, maintenance installations, repairs, C.A.V. lighting, &c.—3669, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COMPETENT Electrician (32), experienced lighting, 'phones, bells, motors, country-house plants, running repairs, desires berth, town or country.—"Electrician," 33, Percy Street, Shrewsbury. 3573

COMPETENT Plant Electrician, experienced erecting and running D.C. lighting and power plants, accumulators, wiring, suction gas and oil engines, repairs; technical experience; maintenance berth preferred.—3700, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COUNTER Salesman (26), ex-service, good address, 10 years' experience first-class firms, excellent testimonials, moderate salary.—3525, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DEMOBILISED Officer, 2½ years lieutenant (electrical) R.N.V.R., 10 years' experience of cable work with power companies and cable contractors, is open to accept post where live man is required.—3557, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DESIGNING Engineer and Manager, with broad experience, seeks a position of responsibility which requires extensive ability; motor control equipments and ironclad switchgear.—3735, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DISENGAGED Youth (18), good electrical knowledge, two years' experience electrician's mate, reliable, good references.—Miller, 69, Netherwood Road, W. 14. 3713

ELECTRIC (Wireman) wants change, all-round hand, good jobbing, excellent references, shore or shipping, home or abroad, language, district rate.—B., 1, Rosslyn Hill Mews, Hampstead, N.W. 3. 3665

ELECTRICAL Engineer, disengaged; 12 years' experience all-round work, country house lighting, etc.—3729, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(*Continued on next page.*)

SITUATIONS WANTED.—*Continued.*

ELECTRICAL Engineer, demobilised, requires position of responsibility with engineering firm in London district; accustomed to control of contracts, power plants, consulting office experience, good organiser.—3736, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, energetic, progressive, seeks situation at home or abroad.—84, High Street, Homerton, E. 9. 3500

ELECTRICAL Engineer, experienced in hydro-electric, power and transmission schemes, with an extensive knowledge of industrial work, is open to engagement.—3537, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (young) seeks new appointment; four years' practical experience on motor test beds, &c., also theoretical training; highest references.—Address Cyril James, "Llanrwst," Church Road, Boldmere, Erdington. 3698

ELECTRICAL Engineer (40) requires appointment where organising ability and business acumen really count. Previous experience mainly in distribution work.—3556, ELECTRICAL REVIEW 4, Ludgate Hill, London.

ELECTRICAL Fitter wants work, repairs, magnetos, lighting and starting sets, turning and fitting; ex-navy.—Hayes, 1, Grimaldi Street, Pentonville. 3716

ELECTRICIAN (age 38 years), 25 years' experience, any system; also 'phones.—W. S., 13, Tamworth Street, Fulham. 3749

ELECTRICIAN and Improver seek change; lighting (all systems), power and plants; day, contract or piece work; any distance. —3701, ELECTRICAL REVIEW, 4 Ludgate Hill, London.

ELECTRICIAN, charge (46), seeks engagement, factories, maintenance or contractors installations, recent situation five years; references.—Stemp, 86, Blackhorse Lane, E. 17. 3668

ELECTRICIAN, disengaged, 20 years' West End experience; all systems.—G. W., c/o Mr. Gregory, 256, High Road, Willesden. 3685

ELECTRICIAN, good all-round hand, installation or maintenance, London or Country.—Lincoln, 33, Haverhill, Road, S.W. 12. 3661

ELECTRICIAN, good all-round, 10 years' practical experience (Indentures) disengaged.—Write G., 6, Gloucester Place, Windsor. 3656

ELECTRICIAN seeks situation, all systems.—P., 63, Woodcote Place, West Norwood, S.E. 3523

ELECTRICIAN seeks situation, lighting, bells, power.—3592, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN wants charge of institution, hotel or country-house plant; used to batteries, oil engines, general repairs, 'phones, lights, &c.; excellent references.—C., 1, Venetia Road, Hornsey, N. 3704

ELECTRICIAN, who anticipates emigrating to New Zealand, would like to get in touch with British firms with view to employment on arrival. Willing to specialise.—3742, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN, 15 years' experience, desires change, progressive position; good all-round knowledge; trustworthy, present situation seven years; good references.—3627, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN, 20 years' references; charge, maintenance, factory, hotel, car, requires light employment, handy bench, lathe.—H., 8, Milton Road, West Green, London, N. 15. 3585

ELECTRICIAN (32), 18 years' provincial contractors' experience, capable interviewing, estimating, installing, repairs, maintenance, lighting, bells, 'phones speciality, desires change; coast town preferred; permanent, progressive situation; good references; commence October.—3706, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN-Wireman, all systems.—E., 115, Cloudesley Road, Islington, London, N. 1. 3715

ELECTRICIAN-Wireman, competent installations and maintenance, A.C. or D.C.; any distance.—P., 84, Ravensbourne Road, Catford, S.E. 3492

ELECTRICIAN-Wireman disengaged; 15 years' experience on all descriptions of lighting and power; any district.—"Electrician," 82, Rutland Road, Hove, Sussex. 3705

ELECTRICIAN-Wireman, experienced, good all round, seeks employment.—12, Replingham Road, Southfields, London. 3712

ELECTRICIAN-Wireman seeks situation, experienced.—A., 25, Northcroft Road, West Ealing, W. 13. 3678

ELECTRICIAN-Wireman seeks situation, experienced dynamos, motors (D.C.), wiring and general maintenance. Good references.—Harris, 12, West Hill, Reading. 3722

ELECTRICIAN'S Mate (age 18) with all-round practical experience, seeks situation.—A. V. Dean, 32, Putney Bridge Road, Wandsworth, S.W. 18. 3734

EX-R.A.F. Electrician (21), disengaged, seeks situation as Improver-Wireman or Switchboard Attendant, D.C. substation; six years' experience on switchboards, wiring and maintenance.—"Electrician," 29, Junction Street, Dudley, Worc. 3673

SITUATIONS WANTED.—*Continued.*

ENGINEER (32) married, B.Sc., A.M.I.C.E., A.M.I.E.E., Westinghouse training, commercial, drawing office and consulting engineer experience, also several years on railway electrification, and used to handling men. Desires really responsible position, home or abroad, with consulting engineers, railway, manufacturing or industrial concern.—3539, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EX-Service man (21), smart, ambitious, energetic, desires progressive situation with electrical engineering firm. 12 months' experience. Remuneration a secondary consideration.—3532, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EXPERIENCED Storekeeper-Salesman, with 14 years' experience of all electrical apparatus, seeks berth with London wholesale house. Able to deal with correspondence. Reasonable salary. —C., 160, West Green Road, N. 3460

EXPERT Book-keeper (30) seeks permanent position. 12 years' practical experience; good knowledge electrical accounts; capable taking charge complete set ledgers. Highest references.—Apply H., 85, Tollington Park, N. 4. 3651

FOREMAN Overhead Linesman (30), seeks situation; 12 years' experience in town lighting, heavy mains, pole erection and house wiring; two years in India with large electrical firm.—Hart, 72, Stamford Hill, N. 16. 3738

IMPROVER (18) requires change; A.C. and D.C. winding, repairs, &c.—B., 137, Loveday Road, West Ealing, W. 13. 3463

INSTALLATION Inspector wants situation, experienced all systems, H.T., L.T.; eight years with Suburban Supply Co.—C/o Mr. Moore, 57, Percy Road, West Kilburn, N.W. 3684

JUNIOR Charge Engineer (young), seeks position to improve knowledge; excellent theoretical and practical training, sound knowledge of station maintenance, with both A.C. and D.C., steam turbines, gas engines and reciprocating sets, batteries, mains, &c. References.—3443, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

JUNIOR Shift Engineer, age 20, is desirous of change. Thorough knowledge of 3-wire D.C. lighting and traction; also some mains experience. Highest reference from present employers. Moderate salary required.—M. Blake, 5A, Gerston Place, Paignton, Devon. 3726

LAD (17) seeks situation, Electrician's Mate, 12 months' experience.—H. P., c/o Housekeeper, 10, Salisbury square, E.C. 4. 3748

MECHANICAL and Electrical Engineer, with 16 years' experience in the management of tramway and lighting undertakings, municipal and company, at home and abroad, desires position of responsibility in this country.—3365, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

METER Repairer, with 16 years' good practical experience, on A.C., D.C., or prepayment meters, good reference (38) single. —3660, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

OFFICERS' Association (Employment Bureau), Lord Haig's scheme for helping the returned fighting men. Employers are asked to send details of vacancies to the Officers' Association (Employment Bureau), 48, Grosvenor Square, W. 1. (near Bond Street Tube Station). Selected lists of young ex-officers with good records and high educational qualifications promptly supplied. 7230

PILGRIMAGE ex-officer carrying heavy load of ambition up the hill on the road from war to the commercial world, must stop his pilgrimage on the wayside for a job with living wage, depositing heavy energy load with reliable Firm. Mains Department Salesman, business experiences six years.—3662, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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STOREKEEPER, electrical trade, thoroughly experienced seeks situation; good references.—C., c/o Hon. Sec., 55, Bryanston Street, W. 1. 3737

STOREKEEPER wants permanent appointment, motor and electrical accessories; 16 years' experience; London or provinces; card index system.—3459, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

STUDENT, I.E.E.—Electrical Engineer desires change. Experienced in all classes of A.C. and D.C. power and lighting, layouts of any description, also maintenance. Experience, keen, energetic and ambitious.—W. A., 51, Downs Road, Clapton, E. 5. 3708

SWITCHGEAR Manufacture, 18 years' experience patterns, machining, fitting, assembling, tool and jig designing; experienced in control.—3481, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(*Continued on next page.*)

SITUATIONS WANTED.—*Continued.*

TECHNICAL Clerk, accounts, costs, estimating, stenographer, experience with welding systems.—3626, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

THE Royal Engineers Civil Employment Registry solicit the assistance of all employers of labour to place men who have served in that corps into civil employment. Applications for men of all classes and trades will receive prompt attention.—Apply to the Secretary, R.E.C.C.A., Horse Guards, Whitehall, S.W. 1. 3733

WIREMAN, competent, all systems, anywhere.—"Wireman," 1, Edgecombe Road Camberwell Grove, S.E. 5. 3731

WIREMAN (competent), disengaged, all systems, lighting, heating, power, car lighting, magnetos.—"Electrician," 23, Bolwell Street, London, S.E. 11. 3607

WIREMAN disengaged, lighting, power, maintenance.—F. J. S., 20, Clarence Road, Tottenham, N. 3693

WIREMAN (good all round) requires re-engagement, simplex, casing, screw, barrel; good references.—T., Randall Lodge, Grand Drive, Raynes Park, S.W. 19. 3703

WIREMAN, good jobbing and maintenance hand, just disengaged.—"Electrician," 1, Crossley Terrace, Liverpool Road, N. 7. 3505

WIREMAN, long experience, any distance.—"Electrician," 33D, Deacon Street, Walworth, S.E. 3694

WIREMAN, Pre-War experience, thorough all-round man. Capable taking charge.—F., 21, Park Street, Windsor. 3657

WIREMAN, pre-war experience (27); power, light and bells.—"Electrician," 12, Winkfield Road, Wood Green, N. 3584

WIREMAN wants job, all branches, pre-war experience.—67, Hartismere Road, Fulham. 3745

WIREMAN wants work, lighting or power, any system.—A. W. Payne, 45, St. Margaret's Avenue, Harringay, N. 15. 3756

WORKS Manager (light engineering) seeks situation. Well up in production methods; 20 years' experience, drawing, tool designing, &c. Now free. Age 36.—3405, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

X-RAYS, two years' experience; good references.—Chester, Fern Bank, Florence Road, N. 4. 3633

YOUTH (18) requires situation, any capacity, with scope for improving knowledge. Good grasp of applications of electricity. Two years' practical experience.—C. Beilby, Cheddington, Tring. 3647

YOUTH (18), theoretical and practical electrical engineering, seeks situation.—A.C., c/o 61, Silver Street, Edmonton. 3630

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Advertisements are inserted under this heading at 1s. 9d. per line.

ELECTRICAL Engineer with expert knowledge motor-car lighting and starting sets including accumulators, desires Partnership. Small capital.—3740, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, in London, active Partnership in sound well-established electrical business, or electrical manufacturing concern, where capital is wanted for extension of business, and which can bear strictest investigation.—Write fully. 3695, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED Partnership in a small generating station. State capital wanted, confidential, must be genuine. Would invest for sound position, fully experienced.—3664, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WORKING Partner with small capital required for established electrical business.—Apply by letter in first instance with full particulars, 3663, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AGENCIES.

Advertisements are inserted under this heading at 1s. 9d. per line.

ELECTRICAL Engineers, with fully equipped winding shop in London, catering for all classes of repairs to electrical machinery, requires Representatives working on commission basis.—3709, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

Read Hoad & Co.'s offer, under Miscellaneous, if you want publicity, and sales pushed. 3690

THE firm of Joh. Wolff & Co., Ltd., at Gouda, is prepared to give exclusive sale for their Majolica Wall and Ceiling fittings, being much sought after for export. Only houses of good standing need apply.—1045, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR SALE.

LONDON MADE

TOY MOTORS AND FANS.

4-volt Motors, 12/6 each } Subject.
" Fans, 18/- " }
Up to 10 volts 1/6 extra.
Perfect models of latest designs.
F. J. SHENTON & Co., LTD., 68/9, Shoe Lane, E.C. 4. 1056

FOR SALE.—*Continued.*

COUNTY BOROUGH OF WIGAN.

THE ELECTRICITY COMMITTEE invite offers for one Willans High Speed Compound Engine, 3 S. Size, complete with Korting Ejector Condenser, direct coupled, Dick, Kerr & Co. generator, 560 volts, 760 amps., 300 R.P.M., and the following spares:—

18 valve and gland rings.
2 L.P. Piston Rings.
2 H.P. Piston Rings.
1 set of Mains Bearing Bushes.
1 Eccentric Strap.

This set can be seen by arrangement, and further particulars obtained on application to R. Owen, Borough Electrical Engineer, Bradford Place, Wigan.

Sealed tenders, endorsed "High Speed Compound Engine," to be delivered to me.

WILLIAM HENRY TYRER,
Town Clerk.

Town Clerk's Office,
Wigan.
June, 1920. 1110

EGYPTIAN AND INDIAN TAPES.

SIZES, ¼" TO 2½".

PRICES, 4/3 TO 10/- PER GROSS YARDS.

MERCHANT offers above, ex stock, at exceptionally low prices of finest quality. Much below manufacturers' prices.

1058, ELECTRICAL REVIEW,
4, Ludgate Hill, London.

NEW ELECTRICAL MACHINERY.

TWO new Lancashire Dynamos, 500 B.H.P., 1,450 R.P.M., 3-phase, 440 volt, 50 cycle Motors, with slip ring rotors, two bearings, bedplate and complete with starter.

Two new Siemens 3-phase, slip ring Motors, with belt pulley, slide rails, and starter, 24/28 H.P., 400/440 volts, 50 cycles.

Two 500 volt, D.C. Generators, shunt wound, 3 bearings, bedplate, slide rails, pulley, and shunt regulator, 600 R.P.M., 95/130 KW.

Two 100/150 volt, D.C. Generators, shunt wound, 2 bearings, pulley, slide rails, and shunt regulator. Output, 27 KW., 750 R.P.M.

All the above in stock and ready for immediate delivery. Apply—

19, Southampton Buildings, W. A. HOLE.
Chancery Lane, London, W.C. 2. 1091

FOR SALE.

Offers for 12 cwt. 1/10 and 1/14 H.D. copper wire.
One 230 volt, 3-H.P. Motor (series), gear wheels and pinions.
One 230 volt, 2-H.P. Motor (series), gear wheels and pinions.
One 110 volt, 45 amp. Dynamo.
2½ gross aluminium Batten holders.
Two 6 volt, C.A.V. Motor Car Generators (new).
One 110 volt, 7½-H.P., three-phase Motor.
Any class of second-hand electrical gear.
Full particulars.
NEWINGTON ELECTRICAL CO., LTD., 16, Newington, Liverpool. 1073

COUNTY BOROUGH OF WEST HARTLEPOOL.

THE ELECTRICITY DEPARTMENT has for Sale the following Plant:—

One Belliss-Parker D.C. Generator, 600 KW. capacity, 460/520 volts. The set is in good working condition, and can be seen on load by appointment.

One Bellis-Crompton D.C. Generator, 100 KW. capacity, 460/520 volts, in good working order.

J. W. SPARK,
Borough Electrical Engineer.
1047

CAST STEEL PLATES.

ALL one size, 16½ in. long by 4½ in. wide by 11/32 in. thick. 65 tons to clear quickly. New material, never been used, and in excellent condition. Equal to No. 3 temper. Full analysis on application. For immediate sale will accept low price of £30 per ton f.o.r. London.

THOS. W. WARD, LTD., Silvertown, London, E. 16. 1055

(Continued on next page.)

FOR SALE.—*Continued.*

FOR SALE.

ONE COMBINED PLANT, consisting of—

D.C. Motor and A.C. Generator with three bearings, all mounted on combined base plate, machines being of the open multipolar type.

The Motor is wound for 460 V., D.C. It is of 100 H.P. rated at 60/100 H.P., 375/900 R.P.M., direct coupled to A.C. generator of the revolving field type, this generator being arranged for exciting from 230 V. D.C. circuit. Output 68 K.V.A.

Three-phase Generator, both ends of each phase brought out to terminal board. One phase split to make up 2-phase system.

The periodicity is from 25/60 cycles, 100/280 V., and 194/480 V. per phase at 355/900 R.P.M.

The combined set is by Vickers, of Sheffield, in first-class working order and of modern construction.

It is complete with all accessories, switchgear, panels, &c., including:—

Three 30-KW. S.P. Transformers, by the Westinghouse Co., giving 140 V. on the primary and 700 V. on the secondary.
200 amp D.P. Ironclad Knife Switches.
100-H.P., 460 V. Starting Switch for motor.
Two Shunt Regulators for motor field.
One Shunt Regulator for Alternator (field excited from 230 V. D.C. circuit).
One Panel with 4 ammeters, 1 voltmeter with resistance box for different voltages.
One Panel with main switch and fuses and change-over switches for reading current in phases.
One Panel with ammeter switch and change-over switches for transformers.
One Panel with copper links for transformers.
Connections for different phase connections.
One Kelvin Wattmeter.

S. G. LEACH & CO., LTD.,
26-30, Artillery Lane, E.C. 1065

PLANT FOR SALE.

COMPLETE Works Electric Power and Lighting Plant, in perfect condition and very little used, comprising:—

One 15-KW., 110 volt Westinghouse Compound Wound D.C. Generator.

One 200-amp. Ironclad Switch Panel containing D.P. Switch and Fuses, Volt and Ammeters, and Shunt Resistance all totally enclosed and mounted on Channel Iron uprights.

One 5-H.P., 110 volt, 1,400 R.P.M. Swedish Shunt Wound Motor complete with 7 in. by 3½ in. pulley, slide rails, and D.A. Igranic Starter.

One 8-way, 10-amp., H.D. Distribution Board, mounted on slate and enclosed in teak case, together with the whole of the exterior and interior cables, switches, fittings, shades, &c., &c.

Address "Z.E.629," c/o MESSRS. DEACON'S Advertising Offices, Leadenhall Street, London, E.C. 1053

NEW AND SECOND-HAND MOTORS FOR SALE.

H.P.	Voltage.	R.P.M.	Type.	Maker.	Starter.
5½	110 D.C.	700	com. wound	E.C.C.	Yes.
5½	110 D.C.	700	"	Newtons.	"
3½	110 D.C.	700	"	E.C.C.	"
7½	110 D.C.	750	"	E.C.C.	"
5½	110 D.C.	700	"	E.C.C.	"
20	110 D.C.	350/700	series wound	Veritys.	Controller and control panel.
20	220 D.C.	350/700	"	"	"
20	220 D.C.	350/700	"	Laurence Scott.	"
20	220 D.C.	500	com. wound	Brush Co.	"
35	220 D.C.	400/1200	"	Laurence Scott.	"
3½	110 D.C.	direct-coupled to 16" blower, complete with starter.			

Apply—
THE MIDDLESEX CHEMICAL CO. (1917), LTD.,
304, West Ferry Road,
Millwall, E. 14. 890

Ex STOCK.

COPPER WIRE COTTON AND SILK COVERED.
2 cwt. No. 17 S.C.C., at 3s. 3d. lb.
103 lb. No. 20 D.C.C., at 4s. lb.
5 per cent. cash with order.
Other sizes and prices on application.
50 grs. yds. Pirelli 14/36 Cotton Flex.
50 4-way Fuseboards.
25 5-way Fuseboards.
25 6-way Fuseboards.
500 15-amp. Ironclad Switches.
50 30-amp. Ironclad Switches.
50 60-amp. Ironclad Switches.
Large stocks of Motors, &c.
LONDON ELECTRIC STORES, Fulwood House, High Holborn. Telephone: Hol. 4862. 1017

FOR SALE.—*Continued.*

MACHINERY FOR SALE.

TURBO-GENERATORS, D.C. AND A.C.

One 1,000-KW. B.T.H., 440 volts, 50 period, three-phase, with condensing plant complete.
One 1,000-KW. Willans-Parsons-E.C.C., 6,600 volts or 3,300 volts, 50 period, three-phase, with surface condensing plant complete.
One 800-KW. mixed-pressure Turbo-Alternator, by Machinenfabrik Oerlikon, 6,600 volts, 50-period, 3-phase, with surface condensing plant, by Messrs. Allen, of Bedford.
One 500-KW. Parsons, 460/530 volts, D.C., with condenser.

GENERATING SETS, D.C.

One 300-KW. Paxman-E.C.C., 460/580 volt.
One 250-KW. Belliss-G.E.C., 220/230 volt.
One 100-KW. Belliss-Crompton, 110 volts.
One 90-KW. Belliss-Mather & Platt, 460/510 volts.
One 60-KW. Belliss-Dick-Kerr, 220 or 440 volts.
Two 1-KW., 110 volt, Robey-Electromotors, Ltd.

Switchboard (brand new) for 460/550 volt D.C., by B.T.H. Co., 33 ft. long, all complete with latest type instruments. Cost £1,800. All packed in 21 cases ready to despatch. Price £950 f.o.r.

MOTORS, 220 VOLT D.C.

One each 50, 30, 24, 21, 20, 12, 10, 8, 6, and 2 H.P.

The above are mostly Semi-enclosed Shunt Interpole Machines, by Lancs. Dynamo Co., Siemens, Mather, Platt, and Ediswan. All are ready for immediate despatch, and are Complete with Starters, and in most cases Slide Rails.

Apply FRANK GILMAN, 9, Westfield Road, Birmingham.

Telegraphic Address: "Rotherwood, Birmingham." Telephone No.: 1081 Edgbaston. 2128

ELECTRICAL PLANT FOR SALE.

MOTORS.

5, 7½, 10, 25, 50, 75 and 120 H.P., 220 volts D.C.
7, 10, 20, 30, 50, 80, 120, 140, 200 and 325 H.P., 440/500 volts D.C.

THREE-PHASE MOTORS.

10, 15, 25, 30, 35, 40, 50 and 56 H.P., 400/500 volts, 50 periods.
20, 50, 75, 90, 160 and 200 H.P., 440 volts, 25 periods.

TRANSFORMERS.

Three new 1,875 K.V.A., 6,600/440 volt, 3-phase, 50 periods.
Two new 625 K.V.A., 6,600/254 volt, single phase, 50 periods.

MISCELLANEOUS.

One 250 KW., 500/110 volt D.C. Motor Generator.
Petrol Electric Sets, 3½, 6 and 14 KW.
Complete Modern Plant, comprising Vertical Boiler and 15 KW., 220 volt, vertical enclosed Steam Set.
580 yards new 110/24 S.W.G. 3-core and Earth Conductor C.T.S. Cable. Also large quantity miscellaneous Machines and apparatus.

THE PHŒNIX ELECTRICAL CO., LTD., 32-36, Broomielaw, Glasgow. 9716

ELECTRIC MOTORS FOR IMMEDIATE DELIVERY AT REASONABLE PRICES.

H.P.	Volts.	Speed.	Make.	Type.
¾	220	1350	G.E.C.	Shunt.
1	220	150	G.E.C.	Shunt.
2	220	1430	Newton	Shunt.
3/5	220	950	Newton (Derby)	Shunt interpolar.
4	220	950	Newton (Derby)	Shunt interpolar.
5	440	950	Phœnix	Shunt.
5	440	1050	G.E.C.	Shunt.
6	460	1100	G.E.C.	Shunt.
6	220	950	Maolure	Shunt interpolar.
10	440	1000	Cutting	Shunt interpolar.
12	400	800	Cutting	Shunt interpolar.
12/5	460	1100	Higgs	Shunt interpolar.
20	440	1020	Cutting	Shunt interpolar.
55	220	300	Hall	Shunt.

Most of the above machines are new and complete with pulleys and starters.

AUTOMATIC MACHINERY CO.,
28, New Union Street,
Ancoats, Manchester.
'Phone, 752 Central. 'Grams, "Autotool," M/r. 860

WOOD BLOCKS.

EXCEPTIONALLY attractive prices for highest class goods in all sizes for prompt delivery.
List and samples on request.
F. J. SHENTON & CO., LTD.,
68/9, Shoe Lane, E.C. 4. 1057

(*Continued on next page.*)

FOR SALE.—*Continued.*

MOTORS FOR SALE.

NEW D.C MOTORS IN STOCK.

No.	Type.	Maker.	H.P.	Volts.	R.P.M.	Pulley.	Rails
8	Totally enc.	—	1/10	220	2500	1½″ Dia.	No.
7	,,	—	1/8	220	2000	1½″ ,,	,,
12	,,	—	¼	220	2000	1½″ ,,	,,
2	Protected	—	¼	220	1400	3″ × 1½″	,,
6	,,	—	½	220	1350	—	,,
1	,,	Siemens	1	220	1700	4½″ × 2″	Yes.
1	Totally enc.	Veritys	2	220	850	6″ × 4″	No.
23	Enc. vent.	G.E.C.	2	220	1050	5″ × 4″	Yes.
14	,,	E.C.C.	2	220	1250	5″ × 4″	,,
12	,,	,,	3	220	900	5″ × 4″	,,
34	,,	Wright Motors	3	220	1250	4″ × 3″	,,
8	,,	E.C.C.	5	440	1000	6″ × 4″	,,
5	,,	Wright Motors	5	440	1200	5″ × 5″	,,
3	Protected	Siemens	6½	440	1160	6″ × 4″	,,
2	,,	,,	7½	440	880	7″ × 5″	,,
4	Enc. vent.	Wright Motors	7½	440	1000	7″ × 5″	,,
5	,,	E.C.C.	8	440	1000	6″ × 4″	,,
5	Protected	Siemens	20	440	820	12″ × 7″	,,

NEW A.C. MOTORS IN STOCK, 50 PERIOD, 3-PHASE, SQUIRREL CAGE.

5	Protected	Wright Motors	5	440	1420	4″ × 3″	Yes.
3	,,	E.C.C.	5	440	1420	6″ × 4″	,,
6	,,	Wright Motors	10	440	940	—	,,

SPECIAL LINES.

Seven 3-H.P., 250 volt, D.C., totally enclosed, 1,350 R.P.M. Westinghouse Motors (no pulleys or rails), with special Brook-Hirst Starting Panels.

One 3-H.P., 230 volt, D.C., protected, 1,300 R.P.M., 4 in. by 3 in. Pulley and Rails, by Wright & Wood. Second-hand, in splendid condition.

One 3-H.P., 250 volt, D.C., enclosed-ventilated, 1,600 R.P.M. Westinghouse, 4½ in. by 3 in. Pulley and Rails. Second-hand, good as new.

One 100 volt, 35 amp. Dynamo, 1,400 R.P.M., 5½ in. by 4 in. Pulley and Rails, by Wright & Wood. Second-hand, good as new.

UNDERWOOD (MANCHESTER), LTD.,
53, Brown Street, Manchester.

'Phone: 5613 City. Telegrams: "Gleaming." 932

NEW MOTORS. DELIVERY FROM STOCK. ALL AT MAKE 'S P E

SINGLE-PHASE, 50 PERIODS, 100/200 VOLTS.

Three ½-H.P. Century, 1,460 R.P.M., two ½-H.P. Century, 1 460 R.P.M., two 1-H.P. Century, 1,460 R.P.M., three 1-H.P. Bi ok, 1,460 R.P.M., four 1½-H.P. Brook, 1,440 R.P.M., one 2-H.P. Century, 1,460 R.P.M., two 2-H.P. Brook, 1,440 R.P.M., one 2-H.P. Brook, 940 R.P.M., one 3-H.P. Brook, 1,440 R.P.M., two 3-H.P. Brook, 940 R.P.M., one 4-H.P. Brook, 1,440 R.P.M.

DIRECT CURRENT, 500 VOLTS.

Two 7½-H.P. Siemens, 1,350 R.P.M.

3-PHASE, 440 VOLT, 50 PERIODS.

Five 5-H.P. Parkinson, 940 R.P.M., two 7½-[illegible] Parkinson, 940 R.P.M., one 7½-H.P. Parkinson, 1,440 R.P.M.

SECOND-HAND MOTORS IN STOCK.

200/230 VOLT, DIRECT CURRENT.

One 3-H.P., 500 R.P.M., one 5-H.P., 1,000 R.P.M., one 10-H.P., 880 R.P.M., one 2½-H.P., 800 R.P.M.

SINGLE-PHASE, 50 PERIODS, 100/200 VOLTS.

One ½-H.P., 1,460 R.P.M., one ¾-H.P., 940 R.P.M., one 2-H.P. 2,800 R.P.M., one 3-H.P., 940 R.P.M., one 10-H.P., 940 R.P.M., slip ring.

DIRECT CURRENT, 100/110 VOLTS.

One 6-H.P., 770 R.P.M., one 2-H.P., 1,550 R.P.M.

MIDLAND DYNAMO & MOTOR REPAIRS CO., LTD., Volta Works, 64, Belgrave Gate, Leicester. 930

FOR SALE.

ONE 85 H.P. variable-speed Motor, 220 volts D.C., 250/500 revolutions, protected type, compound wound with interpoles, engine type machine, no bedplate but with Brook-hirst starter and shunt regulator, all in new condition. Makers: The Lancashire Dynamo Co., Ltd.

One 45 H.P. variable-speed Motor, 220 volts D.C., 325/650 revolutions, protected type, compound wound with interpoles, no bedplate, but with Brookhirst starter and shunt regulator. Makers: The Lancashire Dynamo Co., Ltd.

One 30 H.P., Motor, 220 volts D.C., 760 revolutions, open type, compound wound, with bedplate, slide rails and starter. Makers: The Lister Engineering Co., Ltd.

Also 21 lengths in 90 per cent. Carbon Steel, in diameters 3 in. to 1½ in.

Please address offers and all further inquiries to—

TURNER BROTHERS ASBESTOS CO., LTD.,
Purchase Department, Rochdale.

809

FOR SALE.—*Continued.*

R. H. LONGBOTHAM & CO., LTD.,
41, Station Road, Doncaster;
and at Milburn House, Newcastle-on-Tyne.

Tel: 576 Doncaster. 867 Newcastle. Telegrams: "Machinery, Doncaster."

FOR SALE.

One Babcock & Wilcox Water Tube Boiler, capacity 3,454 sq. ft., without superheater, but with chain grate stokers.

Two Lighting Sets, 30-KW. bipolar Dynamos, by E.C. Co., 250 volts, 120 amps.

One Surface Condenser, capacity 420 sq. ft. cooling surface, having solid drawn brass tubes, complete with Air and Circulating Pumps.

Four Rotary Mining Drills, 4 H.P., 440 volts D.C.

One Hopkinson Coal Cutter, with 25-H.P. Motor, 450 volts, D.C., complete with Jib and Crane. 5277

FOR SALE.

300	H.P.	400/440 volts,	D.C.	360	R.P.M.
65	,,	440/460	,, ,,	930	,,
40	,,	,,	,, ,,	1,030	,,
7½	,,	,,	,, ,,	1,000	,,
5	,,	,,	,, ,,	1,200	,,
4	,,	200/230	,, ,,	1,200	,,
3	,,	100/110	,, ,,	1.800	,,
9	,,	100/110	,, ,,	1,050	,,

ALTERNATING CURRENTS.

15	H.P.	S.R.	400/440 v.,	3 phase,	50 period,	960	R.P.M.
25	,,	,,	,,	,,	,,	720	,,
28	,,	,,	,,	,,	,,	720	,,
35	,,	,,	,,	,,	,,	720	,,
50	,,	,,	,,	,,	,,	720	,,
31	H.P.	S.C.	500	,,	,,	1,420	,,
30	H.P.	S.R.	200/230 v.,	1 phase,	,,	1,420	,,

BURY ELECTRICAL PLANT CO., LTD.,
Phœnix Street, Bury.

'Phone: 676. 'Grams: "Electric." 852

SWITCHGEAR FOR SALE.

DYNAMO SWITCHBOARD, consisting of ammeter 0/250, Central reading ditto 0/150.

Volt Meter 0/200, 7 in. Dials, regulating resistance, and various Switches, all mounted on fine white marble panel, about 7 ft. high, pipe framework, &c., as new.

30-H.P., 220 volt Igranic automatic Starter, and 3-H.P., 530 volt E.C. and J. ditto. Hardly used.

25-H.P., 480 volt Brookhirst Starting Panel Pillar.

THE VICTORIA ELECTRIC PLANT CO., 8-10, Spencer Street, Westminster, S.W. 1.

'Phone: Victoria 4122-4123. 'Grams: Vicminster, Sowest, London. 1079

FOR SALE.

HORNSBY OIL ENGINE, 5½ B.H.P., with flywheel, silencer, condenser, &c.

Continuous current Dynamo, having an output of 40 amperes at 35 volts, shunt wound.

Engine Room Switchboard, complete with accumulator, regulator, shunt regulator, and automatic cutout.

Set of accumulators, consisting of 15 cells, 15 plates, N. L. Hart type.

Self-acting Lathe, 4½ inch centre, Screw cutting, back geared, with gap bed.

To be seen in the neighbourhood of Sevenoaks, Kent.

Application to be made in the first instance to ARTHUR W. COOKSEY, F.R.I.B.A., 6, Adam Street, London, W.C. 2. 1075

ELECTRIC MOTORS READY FOR DELIVERY.

SALE OR HIRE. NEW AND SECOND-HAND.

¼ H.P., ⅜ H.P., ½ H.P., 100/110 volt D.C.
¼ H.P., 2½ H.P., 5 H.P., 7½ H.P., 10 H.P., 20 H.P., 200/240 volt D.C.
3 H.P., 5 H.P., 7½ H.P., 10 H.P., 400/440 volt D.C.
20 H.P., 480/530 volt D.C., nearly new, B.T.H., 950 R.P.M.
10 H.P., 15 H.P., A.C., 3 P., 50 cycles, slip-ring, 950,
15-in. Sturtevant Fan Box Blade, 220/240 volt D.C.

Apply STOCKWELL & OHMS, LTD., 15, Penton Place, King's Cross, W.C.1. 'Phone 2680. 2941

(Continued on next page.)

FOR SALE.—*Continued.*

STEAM GENERATING SETS FOR SALE.

780-KW. Belliss-Dick Kerr, A.C. Steam Generating Set, 2,200 volt, 1-phase, 60 cycles, with Allen Condenser if required.
500-KW. Belliss-B.T.H. D.C. Steam Generating Set, 220 volts, 300 R.P.M.
300-KW. Belliss-Rees Roturbo D.C. Steam Generating Set, 500/560 volts, 375 R.P.M., with Switchboard.
250-KW. Belliss-G.E.C. A.C. Steam Generating Set, 2,200 volts, 1-phase, 60 periods.
250-KW. Belliss-Lahmeyer D.C. Steam Generating Set, 220 volts, 150 lb. pressure.
170-KW. Belliss-Siemens D.C. Steam Generating Set, 220 volts, Compound Engine.
60-KW. Allen High Speed Enclosed Steam Generating Set, 240 volts, 400 R.P.M., Shunt Wound.
75-KW. Belliss-Holmes, 110 volts, 680 amps., D.C., complete with Condensing Plant.

HARRY H. GARDAM & CO., LTD., Staines. 9047

FOR SALE.

Two 2-H.P., 440 volt., D.C., Cranerated Motors.
6,000 110-volt, 8-C.P., Tubular Carbon Lamps, S.B.S.
2,000 8-volt, 8-C.P., Metallic Filament round pipless, S.E.S. Osram and Ediswan Lamps.
2,000 8-volt, 8-C.P., Metallic Filament, tubular S.E.S. Mazda Lamps.
One 10-H.P., 110-volt, 50-period, single-phase Brook Motor.
Three 30 by 10 Denbigh Plain Millers.
One 6-in. Slotting Machine.
Nine 6-in. to 7-in. S.S. and S.C. Precision Lathes.
One 26-in. by 8 in. Universal Miller.
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Apply SPRINGVALE ENGINEERING WORKS, Blythe Road, West Kensington, W. 14. 6665

STEAM-DRIVEN SET.

BELLISS & MORCOM, Vert., Twin, Compound H.S. Engine, 160 lb., pressure, coupled to:—
50-KW., 440 V., D.C., G.E.C. Compound wound Generator, modern Set, good as new.
Lancashire Boiler, 24 ft. by 7 ft. by 160 lb., with all fittings.
Meldrum furnace, Hotchkiss circulator.
Carruthers Feed Pump. Wier Feed Pump.
All pipes, steam traps, &c., complete.
Switchboard, and cables for above.
The whole installation complete, and highly suitable for supplying works with power and light.

Apply, RICHARDS, TURPIN (MINERALS), LTD., Swansea. 575

MOTORS IN STOCK.

Sale or Hire.

10 H.P. Siemens, 500 volts; 10 H.P. Siemens, 220 volts; 7½ H.P. G.E.C., 440 volts; 7 H.P. Electromotors, 480 volts; 6½ H.P. Siemens, 500 volts; 5 H.P. Hurst, 440 volts; 5 H.P. Siemens, 440 volts; 5 H.P. Siemens, 220 volts; 6 H.P. Higgs, 230 volts; 5 H.P. Cutting, 230 volts; 5 H.P. A.E.G., 200 volts; 2½ H.P. Newton, 440 volts; 3 H.P. "S" type, 220 volts; 2 H.P. Higgs, 500 volts; 2 H.P. "S" type, 480 volts; 2 H.P. Cutting, 480 volts; 2 H.P. Higgs, 400 volts; 1 H.P. Crompton, 220 volts; and many smaller. Also A.C. Motors.

E. P. ALLAM & Co., 107, Gray's Inn Road, W.C.1. Museum 6274. "Epaltricals, London." 8441

FOR SALE.

ALTERNATOR.

One 150 KW., 3-phase, 460 volts, 50 cycles new Alternator, complete with direct-coupled exciter, and arranged for belt or rope drive, speed 428 R.P.M. Quick delivery.

D.C. GENERATORS.

One 125 KW., 220 volt, shunt wound D.C. Generator, 490 R.P.M., with massive bedplate and three pedestal bearings, new condition.
One 77 KW., 500/600 volts, shunt wound interpole D.C. Generator, 700 R.P.M., with pedestal bearings, belt pulley, having cast-iron bedplate and slide rails.
A.C. and D.C. Motors always in stock.
Inquiries invited.
HALWAINS, LTD., 44a, Bolton Street, Bury.
Telegrams: Generator. Telephone: Bury 681. 803

MOTORS FOR SALE.

A NUMBER of New and Second-hand Motors for immediate sale.
Motors and Dynamos rewound and repaired without delay, A.C. and D.C.
DUMBRILL, 60, Queen's Road, Battersea, London, S.W. 8. 988

FOR SALE.—*Continued.*

HUDSON'S ELECTRICAL ENGINEERING CO., LTD.

7 and 8, Prudential Buildings, Park Row, Leeds.

'Phone: 22792. Telegrams: "Alternate" and "Beaz" Leeds.

MOTORS FROM STOCK.

SINGLE, TWO, AND THREE-PHASE MOTORS.

SECOND-HAND.

Two nearly new 20-H.P., 2-phase, squirrel-cage Motors, 200 volts, 50 cycles, 500 revs., by E.C. Co., Ltd., complete with pulley, rails, and auto transformer starters.
One nearly new 25-H.P., single-phase, squirrel-cage Motor, by T. Harding Churton, 400 volts, 50 cycles, 960 revs., complete with pulley, rails, and starters.
One nearly new 20-H.P., single-phase, squirrel-cage motor, by Ingleby, Ltd., 400 volts, 50 cycles, 960 revs., complete with pulley, rails, and starter.

NEW.

One brand new Sturtevant 24 in. Porthole Fan, 3-phase, 400 volts, 50 cycles, 560 revs. £25.
One new 30-H.P., 2-phase, squirrel-cage Motor, 200 volts, 50 cycles, 1,400 revs., complete with pulley, rails, and series parallel starter.
Six 1-H.P., 200 volts, 50 cycles, 1,400 revs., single-phase, complete with pulley, rails, and starters.
One 5-H.P., 110 volts, 50 cycles, 1,400 revs., single-phase, complete with pulley, rails, and starter.
Four 2-H.P., single-phase Motors, 200 volts, 50 cycles, 1,400 revs., complete, all as above.
Four 4½-H.P., 2-phase Motors, squirrel-cage type, 200 volts, 50 cycles, 1,400 revs., complete, all as above.
Two 10-H.P., 3-phase, squirrel-cage motors, 200 volts, 50 cycles, 1,400 revs, complete, all as above.
Four 12-H.P., 2-phase, squirrel-cage Motors, 200 volts, 50 cycles, 1,400 revs., complete, all as above.
Fur 4½-H.P., 3-phase, squirrel-cage Motors, 440 volts, 50 cycles, 1,400 revs., complete, all as above.
Four 4½-H.P., 3-phase, squirrel-cage Motors, 400 volts, 60 cycles, 1,400 revs., complete, all as above.
Two new 60-H.P., 3-phase, slip-ring Motors, 94 amps., 346 volts, 50 cycles, 720 revs., by Rhodes Motors, Ltd., complete.
One 12-H.P., 3-phase, squirrel-cage Motor, 400 volts, 50 cycles, 960 revs., complete with pulley, rails, and starter.
One 15-H.P., 3-phase, squirrel-cage Motor, 400 volts, 50 cycles, 1,400 revs., complete, all as above.

DIRECT CURRENT MOTORS.

NEW.

Three 40-H.P., D.C. Motors, 460 volts, 1,000 revs., shunt, 4 pole, with interpoles, complete with pulley, slide rails, and starting panel.
Four nearly new 15-H.P., D.C. Motors, 200/220 volts, 1,500/1,900 revs., shunt, 4 pole, and interpole, enclosed ventilated type, complete with pulley, slide rails, and double automatic semi-enclosed starters. £125 each.
Four new 5-H.P. Motors, 460/500 volts, 1,400 revs., shunt interpoles, complete with pulley, slide rails, and starters.
Tenders wanted for the following steam generating sets, which will be loaded free on rail to buyer:—
One 200-KW. Brush Engineering Co., 500 volts, 120 lb. steam, 250 revs., 4 pole, compound wound generator.
One 60-KW. Generating Set, Reavell-Newton patent, compound engine, 120 lb. steam, generator 60-KW., 500 volts.

The above new Motors are what we have continually in progress of manufacture, and same are sold as fast as completed.

An assortment of second-hand Dynamos and Motors always in stock. Upwards of £30,000 worth always in hand.

ENGINE.

600-I.H.P. Willans Patent Triple Expansion Engine, totally enclosed type, 160/200 lb. steam, equal to new. Would make ideal engine for mill or works drive. £300.
All guaranteed one year.

HUDSON'S ELECTRICAL ENGINEERING CO., LTD., 7 and 8, Prudential Buildings, Park Row, Leeds.
Telephone: 22792. Telegrams: Alternate, Leeds. 9880

FOR SALE.

100-volt, 100-amp., compound interpole protected Dynamo with spare armature.
Plating Dynamo, 6 volts, 340 amps., by Scott & Mountain, Drummond & Co., Middlesbrough.
50-H.P. 440-volt, 3-phase, 40-cycle Bruce Peebles Motor, 760 revs., with Ellison starter.
15 and 23 H.P., 220 volts, compound interpole Motors, by Boothroyd, 1,500/1,900 revs., with Brookhirst panels, 3 and 7 B.P.H. gas engines, installed July, 1919, National and Campbell respectively.
DRUMMOND & Co., Middlesbrough. 321

(Continued on next page.)

FOR SALE.—*Continued.*

D.C. MOTORS AND DYNAMOS IN STOCK.

NEW AND SECOND-HAND.

No. in Stock.	H.P.	Volts.	Speed.	Make.
3	1	100	2000	Vickers.
1	2½	100	1400	Union.
1	3	100	1200	Union.
2	5	100	1200	Brown, Boveri.
3	5	100	1200	City Electric Co.
1	7½	100	1020	Blackburn Starling.
3	1	220	1700	Siemens.
1	1	220	2700	Aston.
14	2	220	1400	Mawdsley.
1	2	240	1210	Siemens.
1	2½	200	550	Rhodes.
1	3	250	1400	Electrical Eng. Co.
1	3	200	850	Cutting.
1	3	220	1000/1500	Westinghouse
2	3	220	950	Siemens.
2	4	220	1500	Brown, Boveri.
1	5	200	2000	Lahmeyer
1	5	200	1600	Continental.
1	7½	220	1050	Morris Hawkins
1	15	220	900	Aston.
4	2	480/530	1760	B.T.H.
3	2½	480/530	1400	B.T.H.
1	3	530	1100	Cutting.
1	3	480	1200	Lundell.
1	4	500	650/1000	Adnil.
3	5	440	1400	Siemens.
5	5	500	1000	Siemens.
2	7	460	1000	Flather.
6	11	440	920	Phœnix.
1	15	440	1080	Cutting.
2	20	440	820	Siemens.
3	20	500	820	Siemens.
1	30	460	800	Flather.
1	50	460	600	Parker.
1	50	400/480	600	Westinghouse.

Also a number of Dynamos 100 volts, 10, 20, 30, 40 & 50 amps.

THE VICTORIA ELECTRIC PLANT CO., Spenser Street, Westminster, S.W.1. 'Phone: Victoria 4122-4123. 'Grams: Vicminster, Sowest, London. 1080

ELECTRIC LIGHTING ACCESSORIES.

Special lines in stock offered at Low Prices.
12,000 S.C. Cord-grip Holders (solid ring).
5,000 S.C. ¼ in. Cord-grip Holders (solid ring).
1,500 S.C. ⅜ in. Cord-grip Holders (solid ring).
3,000 S.C. Cord-grip Holders (heavy English).
1,000 S.C. Cord-grip Holders (heavy English) (best).
3,000 S.C. Min. Batten Holders (S.B.C.), (heavy cast backplates).
3,000 S.C. c/g Key Switch Holders.
720 S.C. c/g Push Bar Holders.
720 S.C. ¼ in. Push Bar Holders.
3,000 Edison Screw Holders (¼ in. and c/g).
10,000 Bayonet Plug Adaptors.
500 5-amp. S.P. Oblong Cutouts.
1,000 10-amp. S.P. Oblong Cutouts.
2,500 10-amp. S.P. Bow Cutouts (plaster lined).
10,000 Porcelain Cleats (various), 1½ in., 2½ in., 4 in.
40,000 China Connectors (various).
10,000 Wood Blocks (all sizes).
200 8 in. and 144 12 in. Opal Bowl Fittings (complete).
300 Opal Bowls (8 in., 10 in., 12 in., 14 in.).
10 miles 1/22 and 20 miles 1/20 Bell Wire, S.I.R., D.C.C.
Bell Indicators, Bell Pushes, Bells, Dry Batteries, Zincs (H.D.), Porous Pots, Salammoniac, Alabaster Bowls.
Immediate delivery, subject to being unsold.

THE NEWMAN ELECTRICAL CO., 64, Newman Street, London, W.1. Telephone: Museum 2039. Telegrams: "Nulecspli, Ox, London." 1112

H.T. TESTING SET FOR SALE.

Suitable for Cable Makers, Armature Winders and Others.

COMPRISING of Steel Cubicle containing Siemens Rotary Converter—input, 440 v., D.C., to 290/300 v., 50 p., 1 ph., also Berry's Transformer with terminals, 290/300, 500, 1,000, and 2,000 volts; Switchgear mounted on Angle Iron Panel.

The whole of the above is self-contained, and is absolutely New.

The Cubicle may be separated, which would make a splendid Oven for Armature Baking.

ANDERSON, ANGELL & Co., 102, Central Street, London. E.C.1. 1001

HECKMONDWIKE URBAN DISTRICT COUNCIL.

Electricity Department.

FOR SALE, one 75-KW. Reavell-Fowler Generating Set. Steam 160 lb. Voltage 460-550 D.C.

One Fowler Generating Set. Voltage 460-550 D.C.

Can be seen working by appointment.

Electricity Works, Bath Road, Heckmondwike, Yorks. 853

FOR SALE.—*Continued.*

NEW MOTORS for IMMEDIATE DELIVERY ex STOCK.

Four 1-H.P., 480/530 volts, 1,730/1,880 revs.
Thirty-six 2-H.P., 480/530 volts, 1,600/1,750 revs.
Twenty-four 3-H.P., 480/530 volts, 1,460/1,550 revs.
Eighteen 5-H.P., 480/530 volts, 1,340/1,430 revs.
Sixteen 9-H.P., 480/530 volts, 1,230/1,315 revs.
Six 10-H.P., 400/460 volts, 935/1,035 revs.
Five 12-H.P., 480/530 volts, 1,100/1,190 revs.
Four 20-H.P., 400/460 volts, 760/825 revs.
Six 23-H.P., 480/530 volts, 900/950 revs.
One 30-H.P., 400/460 volts, 700/775 revs.
Thirty 2-H.P., 200/250 volts, 1,335/1,610 revs.
Six 3-H.P., 200/250 volts, 1,220/1,430 revs.
Seven 5-H.P., 200/250 volts, 1,120/1,200 revs.

The above machines are perfectly new as received from makers. We specialise in Motors of B.T.H. manufacture, and in consequence of our placing large stock orders each month we are able to offer all sizes of Motors from 1 to 30 H.P. for immediate and early delivery.

Each Motor is complete with accessories, and is covered with maker's usual six months' guarantee.

Delivery can be had at once ex our stores:—
Kirtling Street, Battersea.—'Phone: Brixton 1963.
Chiswell Street.—'Phone: Central 6446.
Britannia Street.—'Phone: Central 6023.
Clacton-on-Sea.—'Phone: Clacton 103.

In addition to the above, we have a large stock of nearly new machines, both A.C. and D.C., which are covered with our guarantee of three months.

C. J. FERGUSON & SONS, 54, Chiswell Street, London, E.C.1. 1113

A.C. MOTORS FOR SALE.

THREE-PHASE, 50 PERIODS.

One 250-H.P., 400/440 volts, 485 R.P.M., slipring.
One 200-H.P., 400/440 volts, 485 R.P.M., slipring.
One 150-H.P., 400/440 volts, 485 R.P.M., slipring.
One 100-H.P., 400/440 volts, 585 R.P.M., slipring.
All new. Ready for delivery end of July.
One 200-H.P., 400/440 volts, 580 R.P.M., slipring.
One 150-H.P., 400/440 volts, 720 R.P.M., slipring.
One 120-H.P., 400/440 volts, 720 R.P.M., slipring.
Second-hand, with Starting Gear. Immediate delivery.
One 70-H.P., 400/440 volts, 485 R.P.M., slipring.
Three 55-H.P., 400/440 volts, 720 R.P.M., slipring.
Three 46-H.P., 400/440 volts, 720 R.P.M., slipring.
Two 35-H.P., 400/440 volts, 720 R.P.M., slipring.
Three 28-H.P., 400/440 volts, 720 R.P.M., slipring.
All new. Immediate delivery.

SQUIRREL CAGE.

One 32-H.P., 400/440 volts, 585 R.P.M., squirrel cage.
Four 35-H.P., 400/440 volts, 720 R.P.M., squirrel cage.
Two 18-H.P., 400/440 volts, 720 R.P.M., squirrel cage.
Three 15-H.P., 400/440 volts, 960 R.P.M., squirrel cage.
Two 7½-H.P., 400/440 volts, 960 R.P.M., squirrel cage.
Two 3½-H.P., 400/440 volts, 1,450 R.P.M., squirrel cage.
One 2½-H.P., 400/440 volts, 1,450 R.P.M., squirrel cage.
All new. Immediate delivery.

C. L. TURNER, 49, Deansgate, Manchester. Tel.: 1603 City. 1108

ELECTRIC MOTORS FOR SALE.

TWO 50-H.P., 240 volts, 625 revs., shunt, International, with starters (make good generators), 4 pole.
One 40-H.P. ditto, 700 revs., 240 volts, with starter.
One 8-H.P., 240 volts, 1,050 revs., 4 pole, shunt.
One 35-H.P., 240 volts, 500 revs., shunt, Westinghouse.
Three 10-H.P., 240 volts, 495 revs., series enclosed, B.T.H.
One 5-H.P., 460 volts, 1,325 revs., shunt, 4 pole, new.
One 30-H.P., 460 volts, 800 revs., shunt, 4 pole, new.
One 4 and 4½-H.P., 2 ph., 200 volts, 50 cycles, slip ring.
One 5-H.P., 440 volts, 3 ph., 25 cycles, squirrel cage.
Three 7½-H.P., 440 volts, 3 ph., 50 cycles, squirrel cage.
Two 15-H.P., 220 volts, 1,500 revs., compound multipole.
One 11-H.P., 3 ph., 440 volts, 50 cycles, squirrel cage, new.
Battery new storage cells (54), 120 amp.-hr., 10 hr. rate.
Converter, 460 volts D.C., to 60 volts 40 amps.
Number of other A.C. and D.C. Motors, Dynamos, Alternators, and Generating Plant. List free.

EDWARD BINNS, 5, Osborne Terrace, Gosforth, Newcastle.
Telegrams: "Phase, Newcastle." 3702

MOTORS.—IMMEDIATE DELIVERY.

FULL range of D.C. Motors from ¼-H.P. to 30-H.P. All standard voltages in stock. For immediate delivery.
Full guarantees. Attractive prices.

ELLIS & WARD, LTD., Portugal Street, Kingsway, London, W.C. 2.
Telephone: Holborn 595. 973

(Continued on next page.)

FOR SALE.—*Continued.*

DIRECT CURRENT MOTORS FOR SALE.

Variable Speed Type, with Brookhirst Control Panels.

Three	7½ H.P.	220 volt	450/900 revs.	B.T.H.	£128
Eight	12½ „	440 „	500/1000 „	Crompton	£145
Three	16 „	240 „	400/1200 „	Peebles	£155
Seven	16 „	240 „	400/1200 „	Lancashire	£160
Five	18 „	440 „	210/630 „	Westinghouse	£228
Two	20 „	440 „	310/930 „	Lancashire	£210
Three	24 „	440 „	400/1000 „	Lancashire	£210
Two	25 „	250 „	200/600 „	Lancashire	£240
Two	34 „	250 „	200/600 „	Lancashire	£295

THE PHŒNIX ELECTRICAL CO., LTD., 32/36, Broomielaw, Glasgow. 820

ELECTRICAL COOKING APPARATUS.

THE HORNSEY BOROUGH COUNCIL have for disposal the following electrically-heated apparatus lately used in their National Kitchen :—

One large and two small Roasting Ovens.
Three Boiling Pans (capacity approx. 17 gallons each).
Two Oval Fish Friers on Steel Table.
One Steaming Oven and one Grill.

The above are very suitable for caterers, clubs, canteens, &c.

Further particulars may be obtained and apparatus inspected on application to the BOROUGH TREASURER, Town Hall, Highgate, N.6. 1114

DIESEL-DRIVEN GENERATORS, &c.

DIESEL-driven Generators, 400/500-KW., D.C., 500 or 250 volts, 320 R.P.M., in excellent condition. Low price.

Engines and Dynamos could be sold separately.

Also two 500-KW. Parsons Turbines, 230/250 volts, D.C. (in series 460/500 volts), complete with spare Armature and Condenser.

Exhaust Turbine Set, Willans—E.C.C., 200 KW., 440/500 volts. Complete with Condenser, Pumps, &c.

JENNINGS, West Walls, Newcastle-on-Tyne. 6890

FOR SALE.

DYNAMO, 220 volts, 41 amps., 1,000 R.P.M., compound wound, slide rails and pulley. Price £60 (sixty pounds).

Dynamo, 220 volts, 170 amps., 650 R.P.M., as above. Price £150.

30 H.P., 220 volt push botton control Igranic Starter; also 2 in. Pulsometer Pump.

6/10 H.P. Motor, 440 volts, 930 R.P.M., also Starter. Practically new. £100.

C. F. PARDOE, Electrical and Mechanical Engineer, Dansom Lane, Hull. 1078

ELECTRIC MOTORS FOR IMMEDIATE SALE.

D.C.—480/530 v., 35, 10, 9, 5, 1 H.P.'s.
400/440 v., 8 H.P.
200/220 v., 10, 5, 2, 1½ H.P.'s.
A.C.—200 v., 50 p., 1 ph., slip ring, 9 H.P.
415 v., 50 p., 3 ph., slip ring, 10, 7½ H.P.'s.
'Phone: Bank 5121. All guaranteed.

ANDERSON, ANGELL & Co., Electric Power Engineers, 102, Central Street, London, E.C. 1. 1000

DYNAMOS.

DYNAMOS for Sale, in first-class running order.

110 volts, 120 amperes, £110.
110 volts, 168 amperes, £130.
110 volts, 60 amperes, £60.
110 volts, 80 amperes, £70.

Also 80 volts, 20 amperes, 650 revs., £100.

ROBINSON & HANDS ELECTRICAL CO., LTD., Barwick Street, Birmingham. 1092

ELECTRIC MOTORS IN STOCK.

5, 7½, 12, 40, 45, 65, and 300-H.P., 400/460 volts, D.C.
1, 2, 3, and 4-H.P., 220/230 volts, D.C.
3-H.P., and 9-H.P., 100/110 volts, D.C.
10, 15, 25, 28, 35, and 55-H.P., slip ring, 400/440 volts, 3-phase, 50 cycles.

Good stock of D.C. Starters.

BURY ELECTRICAL PLANT CO., LTD., Phœnix Street, Bury. 1095

FOR SALE.—*Continued.*

MOTORS FOR SALE.

A SPECIAL SELECTION of six almost new 100-H.P. A.C. Motors. Made by B.T.H., and only run a few months. 500 volts, 3-phase, 50 periods, 730 R.P.M.

Slip ring, induction protected type, with self-oiling bearings, driving pulley 18 in. diameter, 16 in. face. Including oil-immersed Starters. Self-contained switchgear and slide rails.

The above are in stock for immediate delivery.

THOMAS MITCHELL & SONS, LTD., Bolton.
Telegrams: "Realise." Telephone: 302 693

FOR SALE.

Boiler.—Babcock & Wilcox double drum, heating surface 1,741 square feet, evaporation 7,000 lb. water per hour, 160 lb. pressure, one feed-water heater, piping.

Generating Set.—Tandem compound engine, 8½ in. and 14 in. by 8 in. stroke, 110-B.H.P., 420 revs., 160 lb. steam, direct coupled to Mavor & Coulson Dynamo, compound wound multipolar, 600 amps., 100 volts.

Drop Hammer.—One 7 cwt. steam drop hammer, 160 lb. pressure, automatic action by foot trigger.

All above for immediate delivery. Can be seen our works.
MAVOR & COULSON, LTD., Glasgow. 1104

URBAN DISTRICT COUNCIL OF WHITBY, YORKS.

FOR SALE, one 100-KW. Parsons Turbo Generator, 500 v., D.C.

One 28-H.P. Vertical Enclosed Steam Engine, complete.

The above plant is in good order, and can be seen running by appointment. No reasonable offer refused.

J. W. PIGGOTT, A.M.I.E.E.,
Engineer and Manager.

Electricity Department,
Council Offices,
Whitby, Yorks. 768

FOR SALE.

TO SUPPLY AUTHORITIES.

One new 600 KW. Bruce Peebles Motor Converter, 6,300/6,600 volts, 3 phase, 50 cycle, to 450/550 volts D.C., 750 R.P.M., suitable for traction or general supply, complete with starting gear.

For price and specification write HALWAINS, LTD., 44a, Bolton Street, Bury.
Telegrams: Generator. Telephone: Bury 681. 804

FOR IMMEDIATE DISPOSAL.

TWO Compound-wound Motors, 440 volts, 150 B.H.P., 500 R.P.M., complete with starting panels.

One 200-KW. shunt or compound wound Generator, 400/440 volts, 300 R.P.M., 2 bearings.

D.C. Motors in stock: 1, 2, and 3 H.P., 200/240 volts; 5, 6½, 7½, 8, 10, 15, 20, 25, 30, 40, and 50-H.P. Motors, 400/480 volts, complete with Pulleys, Rails, and Starters. Siemens and E.C.C. makes.

R. O'BRIEN & Co., 66, Mosley Street, Manchester. 777

ACCUMULATORS.

FULLER'S Block Type, 6-volt and 10-volt Sets, complete in teak cases, brass hinges, outside terminals and solid leather strap. Actual capacity 20 amp.-hrs. Surplus Government Stock, to be sold singly or in quantities considerably below maker's prices. Agencies wanted; see illustrated advert., page 31. CITY ACCUMULATOR CO., 75, Great Eastern Street, E.C.2. Tel.: 1338 Clerkenwell. 1068

D.C. SLOW SPEED GENERATORS FOR IMMEDIATE SALE.

TWO 45-KW., 220 volt D.C., compound wound, three-bearing Generators, by Messrs. J. P. Hall, at 360 revs., pedestal type bearings on bedplate.

AUTOMATIC MACHINERY CO., 28, New Union Street, Ancoats, Manchester. 'Phone: 752 Central. 'Grams: "Autotool," Manchester. 861

ELECTRIC DYNAMOS AND MOTORS.

MACHINES always available for Sale or Hire.
ARMATURES and FIELD COILS rewound or repaired without delay.

'Phone: 5773 Holborn. MACDONALD, SYER & CO., LTD., 295, Gray's Inn Road, W.C.1. 8485

(*Continued on next page.*)

FOR SALE.—*Continued.*

CUNNINGHAM'S REGISTER.

A REGISTER OF MOTORS, &c., for sale and wanted. Send particulars of YOUR NEEDS (as a buyer or seller). MOTORS rewound and repaired.

171, Edgware Road,
'Phone: Padd. 5173 and 5174. London, W.2.

Cheap prepaid advertisements are inserted under this heading at the rate of 3d. per word per insertion,

TRADE RATE 1s. 9d. PER LINE.

Box Number and ELECTRICAL REVIEW address count as seven words.

ADHESIVE (pure rubber) Tapes and Chatterton's, delivery ex-stock, at lowest prices; samples.—Shenton & Co., 68/9, Shoe Lane, E.C. 4. 1061

ADHESIVE Tape, white, 756 lbs., ¾" wide, price 2s. 9d. per lb. Samples on application. — 3711, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ALMOST New, "Cyclone" electric Ventilating Fans, 36 in., 700 revs., 220 v., D.C., 1½ H.P. £40.—R. S. Greenhalgh, Atherton. 1101

ARC Lamp Carbons. Odd lots. Exceptional bargain. — 619, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

BATLEY Corporation Electricity Works. For Sale, one 150-KW., Belliss-Fowler, triple-expansion Generating Set, steam 170 lbs., voltage 440 to 550.—For further particulars apply Borough Electrical Engineer. 1033

CABLE, new, in coils of 110 yds., 600 megohm, N.A., from stock; 7 miles 1/18 at £15 per mile; 10 miles 3/22 at £17 11s. 6d. per mile; 2 miles 3/20 at £23 9s. per mile; 2 miles 7/22 at £27 10s. per mile; 1 mile 7/20 at £37 5s. per mile; 1 mile 7/18 at £58 per mile.—1097, ELECTRICAL REVIEW, 4, Ludgate Hill London.

CABLE.—110 yard coils, 1/18, 19/6, 3/22, 22/-, 3/20, 28/6; Flexible Maroon, 35/40, 38/6, (23/36, 70/40), 49/- grs. yds. from stock.—William A. Morton, 125, Norfolk Street, Sheffield. 1035

CONDUIT Fittings (screwed or plain), round and rectangular boxes, for prompt delivery. — Shenton & Co., 68/9, Shoe Lane, E.C. 4. 1059

COUNTRY House Plant, comprising 14 B.H.P. Bates Oil Engine, Laurence Scott Generator, 150 volts, 75 amps., switchboard, and 500 ampere-hour accumulators. Can be seen running by appointment.—Marsh Bros. (Electricians) Ltd., Sheffield. 1094

DYNAMO, 110 volts, 10 KW., old type but in exceptional good condition, complete with switchboard, amp.-meter, voltmeter, various switches and fittings, £65 net cash.—Craven & District Private Telephone & Electric Co., Skipton. 3679

ELECTRIC Light Cable, new, high quality, 7/25 on ¼-mile and 1 mile drums, 7/22 on 500 yard drums, 7/16 on 1000 and 2000 yard drums, to be sold at absurdly low prices.—Lake, 132, Upper Thames Street, London, E.C. 4. 3754

ELECTRIC Motors and Dynamos for sale, all voltages, new and second-hand; also Steam Generating Sets, 40 KW. at 100 v.; can be seen running.—Constable & Ohlson, 60, Queen's Road, Battersea. 3730

ELECTRIC Motors, 5 H.P., 250-volt, 1000 revs., new, Cromptons, starters and rails, complete. What offers?—3719, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRIC Runabout, two-seater, with motor, meter, resistance, switch; in good order. Chassis with four wheels, two new tyres; in good order. Made by Baker Vehicle Co., U.S.A. £30 or nearest offer.—For particulars, 1005, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL A.C. and D.C. Motors, Cheap.—Climax, 182, Church Street, Kensington. Park 2023. 3671

FIVE Telephones, each five-way, inter-communication, by Peel Conner Co., for sale. In good condition. View by appointment. —1077, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FLEXIBLES to Continental sizes, large quantities for sale.—Particulars, from 3636, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR immediate sale and delivery, high-class Generating Set (by Reavell), three-crank compound high-speed Engine, coupled direct to Generator (by Brown Bouverie & Co.), 190 volts, 375 revs., in first-class condition.—Joseph Pugsley & Sons, Ltd., Lawrence Hill, Bristol. 1040

FOR Sale.—A large number of Motors, for immediate delivery, 110, 220, 460 volts, D.C.; several Motor Generators, suitable for cinemas; Hornsby Oil and Gas Engines.—Surrey Engineering Co., Ltd., 34, Surrey Street, Strand. 1034

FOR Sale, a number of 5-ton and 3-ton Electric Lorries, fitted with Ironclad Exide and Tudor batteries, especially suitable for corporation highways and scavenging departments.—Further particulars 966, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, Complete Electric Lighting Set. Crossley Gas Engine complete with D.C. Dynamo. Output 100 volts, 60 to 80 amps., with Switchboard. In running order.—3653, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR SALE.—*Continued.*

FOR Sale, Crawley Automatic Accumulator Switch, suitable for 50 amp. battery, 27 cells. Also portable cell-testing Voltmeter with spear, reading 3 volts.—1120, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, eight 12½-H.P., 440-volt, 500/1000 R.P.M., enclosed ventilated, shunt interpole, variable speed Motors, by Crompton, with Brookhirst control panels. £145 each.—The Phœnix Electrical Co., Ltd., 32/36, Broomielaw, Glasgow. 570

FOR Sale, large quantity of new, non-association, white cotton-covered, twin-twisted Flexible Wire, 40/36 S.W.G., made by well-known British maker at 48s. 6d. per gross yards, free London, packed ready in warehouse London, subject unsold. — 9775, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, Medical Coils (all descriptions), bells, switches, toy motors, miniature lampholders, circular resistances. Send for samples.—Allen & Parkes, 15, Summer Row, Birmingham. 8501

FOR Sale, Motor Generator, consisting of 500-volt, D.C. motor, coupled to 6-volt, 1000-ampere plating dynamo, and complete with switchboard, &c. Price £235.—The Phœnix Electrical Co., Ltd., 32/36, Broomielaw, Glasgow. 572

FOR Sale, New Motors from stock, 10, 15 and 20-H.P., 500 volt D.C.; 5, 10, 15, 20, 25 and 30 H.P., 400/440 volt, A.C., three-phase, 50 cycle; one 3-H.P., 100 volt, single-phase, 50 cycle, second hand.—W. P. Young & Co., Electrical Engineers, 40, Sanvey Gate, Leicester. 333

FOR Sale, new, 25-KW., 220-volt, Aster Petrol Generating Set, with switchboard, £400.—698, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, new, 220-volt, 5-H.P., shunt-wound, Westinghouse Motor.—Burns, Fox Lane, Whitehaven. 900

FOR Sale, one Ferranti A.C. Meter, 10 amp., 220 volts, 50 periods, single-phase; in perfect order; condition as new. £4 10s. —Wood, North Parade, Ripon. 3670

FOR Sale, one Mather & Platt enclosed ventilated shunt Motor, 22 B.H.P., 200 volts, 850 R.P.M., with pulley; also one Allen steam-driven Dynamo, 15 KW., 235 volts, 650 R.P.M., 80 lbs. pressure. All first-class order.—Further particulars from S. H. Heywood and Co., Ltd., Reddish, near Stockport. 773

FOR Sale or Hire, Motors and Dynamos, 440, 220, 110 volts. Electrical machinery of all kinds.—W. W. Martin, 320, Witton Road, Birmingham. 'Phone: East 883. 5775

FOR Sale (pair) Babcock & Wilcox Boilers, 600 sq. ft. heating surface, 150 lbs. working pressure; now fixed, with economiser. Low price save removal.—Williams & Sons, 37, Queen Victoria Street, London. 1125

FOR Sale, Protecting Cage for Transformer; expanded metal on angle iron frame, 10' 6" long by 7' 6" wide by 6' high, with front double door 5' wide.—Messrs. Simon-Carves, 20, Mount Street, Manchester. 961

FOR Sale, several lengths of leather and Balata driving belts. Have been used at private installations and in good condition. Send particulars of requirements.—Cook, 5, Elton Road, Bishopston, Bristol. 1043

FOR Sale, several lengths, practically new, 3-core, steel armoured Rubber Cable, 19/14, 19/18, 37/14 and 7/.6; 600 megohms. Association grade.—R. F. Winder, Belgrave Electrical Works, Leeds. 9795

FOR Sale, six modern Gas Engine Generating Sets, with 440-volt D.C. generators, from 220 to 500 KW. output.—922, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, six 30-H.P., 500-volt, 50 period, 3-period, slipring Motors, with starting gear, £155 each.—The Phœnix Electrical Co., Ltd., Glasgow. 327

FOR Sale, two horizontal Double-cotton Lapping Machines, six heads each, and one vertical Double-rubber Lapping Machine, six-head, Larmuth's make; almost new. Suitable for armature or bell wire up to 12 S.W.G. Can be inspected in working order.—Offers to 1015, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, two 100-B.H.P., protected-type, slip-ring Motors, fitted with brush-lifting and short-circuiting device, wound for 220 volts, 50 periods, single-phase, 950 R.P.M., with belt pulley, 21" dia. by 18" face, with protected-type stator starter, and protected-type rotor switch and resistances, oil immersed, and slide rails and holding-down bolts.—9538, ELECTRICAL REVIEW 4, Ludgate Hill, London.

FOR Sale, two 220 and one 500-KW., 440-volt, D.C. Gas Engine Sets. No producers.—838, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, Verity Electric Motor, 5 H.P., 110 volts, 1100 revs., complete with standard pulley, slide rails and D.P. ironclad switch; brand new, not unpacked. Will accept £90 f.o.r. for immediate delivery.—Apply C. Barton, Clapham, Yorkshire 541

FOR Sale, vertical, high pressure, 3-throw, geared Pump, by Hayward Tyler, 7½" plungers, capacity about 10,000 gallons; suitable for motor drive.—Williams, 37, Queen Victoria Street London. 1011

(*Continued on next page.*)

FOR SALE.—*Continued.*

FOR Sale, 4½-H.P. Crossley Gas Engine and 174 ampere-hour 50-volt Tudor Battery; all new, not unpacked.—Barnett and Sons, Electrical Engineers, Stoke-on-Trent. 990

FOR Sale, 10-cwt. Electric Goods Lift, Reliance make, complete with all gear and 6 H.P. motor, cage 6′ 6″ × 4′ 6″, offers wanted for immediate delivery.—Empire Stores, Ltd., Sackville Street, Bradford. 3677

FOR Sale, 10-H.P. Motors, 400/230 volts, 50 cycles, 3-phase, slip-ring with pulley, new, £70; rotor starter, £10; 7½-H.P. ditto, £60. Large numbers in stock; immediate delivery.—Sugdens, Wakering Road, Barking. 2915

FOR Sale, 30 Hart Accumulators, type NL 9, 216 ampere hours; complete and in perfect condition; can be seen at Coalisland, Co. Tyrone. Best offer secures.—John Stewart, Electric Lighting Station, Boyle, Ireland. 1122

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FOR Sale, 360 yards 91/12 Aerial Cable, double braided, quite new, 240 and 120 yards lengths on drums.—R. F. Winder, Belgrave Electrical Works, Leeds. 9209

FOR Sale, 670-K.V.A., 440-volt, 50-period, 330 R.P.M., 3-phase, engine-type Alternator, by Bruce Peebles & Co., with direct-coupled exciter; no engine; £900.—The Phœnix Electrical Co., Ltd., 32/36, Broomielaw, Glasgow. 571

FOR Sale, 700-KW., 3300-volt, 50-cycle, 3-phase, engine-type Alternator, no engine.—697, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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NEW D.C. Motors by B.T.H. Co. Prices include rails and pulleys. 1 H.P., 100 volts, 1300 revs., £30; 7½ H.P., 220 volts, 1100 revs., £85; 5 H.P., 220 volts, 1250 revs., £72; 10 H.P., 480 volts, 1100 revs., £112; 12½ H.P., 480 volts, 1010 revs., £125; 20 H.P., 480 volts, 900 revs, £175.—Bernard Meggitt, Engineer, Mansfield. Tel. 224. 993

FOR SALE.—*Continued.*

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NEW D.C. Motors, by Phœnix Dynamo Co. Prices include rails and Pulleys. 11 H.P., 400/480 volts, 920 revs., £135. 14 H.P., 400/480 volts, 1180 revs., £137. 20 H.P., 400/480 volts, 1190 revs., £170. 31 H.P., 400/480 volts, 1020 revs., £225.—Bernard Meggitt, Engineer, Mansfield. Tel. 224. 995

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THREE-Phase Motor, 50-H.P., 415-volt, 50-cycle, 960 R.P.M., slip-ring. £200.—The Phœnix Electrical Co., Ltd., 32/36, Broomielaw, Glasgow. 699

TUDOR Battery, 55 nine-plate cells in glass, 8½″ × 8½ × 18″ high; £50.—Cambridge & Paul Instrument Co., New Southgate, N. 11. 3446

(*Continued on next page.*)

FOR SALE.—*Continued.*

TWO Motor-Generator Sets, input 400/440 D.C., output 55 volts., 60 amps., complete with starting switch and rheostat, one only; stand-by resistance 400 volts., 60 amps. Can be seen working by appointment, shortly being replaced with larger plants. Offers solicited.—Doughty & Co., 32, Queen Street, Albert Square, Manchester. 1049

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250-KW. Steam Generating Set, 220 volts, D.C.; built in 1915 by James Howden and the Lancashire Dynamo Co. Also spare armature.—Apply to Edmundsons' Electricity Corporation, Ltd., 11, Tothill Street, Westminster. 837

350-H.P., 500-volt, 500 R.P.M., compound wound, 3-bearing Motor, by The Electrical Construction Co., Ltd., with control gear. £900.—The Phœnix Electrical Co., Ltd., 32/36, Broomielaw, Glasgow. 700

440/460 volt. D.C. Motors, shunt wound, 25 H.P. 500 revs., 21 5 H.P. 650 revs., three 15 H.P. 870, 650, and 500 revs., 12½ H.P. 1000 revs., 10 H.P. 960 revs., 3 H.P. and 2 H.P. 1350 revs. Also 220 volt. D.C. shunt wound motors, 20 H.P. 600 revs., 12 H.P. 680 revs., 5 H.P. 350 revs., 2 H.P. and 1 H.P. 1500 revs. All in first-class running order.—Robinson & Hands, Ltd., Barwick Street, Birmingham. 1042

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Switchboard for above with instruments complete.
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(*Continued on next page.*)

ARTICLES WANTED.—*Continued.*

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ONE 10/20-H.P., 400-volt, 1-phase, 50-period Motor.—Winder, Belgrave Electrical Works, Leeds. 1088

ONE 12/15-H.P., 500-volt D.C., Shunt or Compound-wound Motor, 1050/1150 R.P.M. Submit sketch showing height from base to centre of shaft and plan of base showing distance out to end of shaft.—Western Engineering Co., Swansea. 840

ONE 50-H.P. 3-phase, 400-volt, 50 period slip ring Motor and Starter, also slide rails and pulley.—State condition, make and price to A. G. Bullen & Co., Blackfriar Street, Carlisle. 3641

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WANTED, a 20-H.P. also a 10-H.P. Motor, 210 volts, 90 cycles, single-phase, with pulley, slide rail and starter.—Write 120, Pratt Street, N.W. 1. 913

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WANTED, either new or good second-hand, 220-volt, D.C., Motor 15 H.P., either series or compound wound, 500/1000 R.P.M., with or without reversing controller and constant rated resistance.—Western Engineering Co., Swansea. 9360

WANTED, Electrical Sets, all sizes, boilers, accumulators dynamos, motors, &c.; also scrap cable and metals. Complete plants purchased.—Williams & Sons, 37, Queen Victoria Street, London, E.C. 4. Telephones: 3938 City and 834 Hop. 8574

WANTED, Ellisons enclosed pedestal oil Circuit-breaker with no-volt and overload releases. Triple pole for 200 amps., 440 volts., 50 cycles.—Write, stating full particulars, Box, 1234, Willings, 125, Strand, W.C. 2. 1054

ARTICLES WANTED.—*Continued.*

WANTED, Gas Engine, in good condition, not under 30 H.P. Also Dynamo, 220-volts., compound wound, not less than 25 KW.—Apply to Edwards & Co., 36, Orleans Road, Twickenham. 3659

WANTED immediately 3000 yds. of 39/14 single Cable or its equivalent in a 1000 yd. length of 3-core Cable, also 3000 yds. of 61/14 or its equivalent in a 1000 yds. length of 3-core Cable. 240 large insulators, 40 poles 15'×6" dia. approximately. —J. F. Wake, Geneva Works, Darlington. 1046

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WANTED, Motor Generator, 230/240 volts, D.C., to 75 volts, 40 amps.—John Stewart, Electric Lighting Station, Boyle. 3625

WANTED, new or second-hand, 550-KW., Oil-driven Generating Set, either direct-coupled or belt-driven, A.C., 2200 volts, 3-phase, 50 periods. State full particulars, age, where seen, and lowest price.—3642, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Plating Dynamo in good running order. Output not less than 10 volts 500 amperes.—Capper Pass & Son, Ltd., Bedminster Smelting Works, Bristol. 1086

WANTED, second-hand Electric Motor to give approximately 150 B.H.P. and suitable for 500-volt, 3-phase, 50-cycle circuit.—Particulars and price to R. Silcock & Sons, 56, Great Howard Street, Liverpool. 921

WANTED, steam Generating Set, 60/100 KW., 220 volts, D.C., 150 lbs. steam pressure.—Full particulars to H. K. Benson, Consulting Engineer, 63, Wind Street, Swansea. 3682

WANTED, Turbo-Generator (mixed or low pressure), 550 volts D.C., any power 250 to 700 KW., complete with condenser. Please quote make of turbine, generator and condenser, date of manufacture, condition, send print and full particulars.—Edwards and Shaw, Consulting Engineers, 105, Colmore Row, Birmingham. 1030

WANTED, very large quantities Porcelain Cleats 1⅛" long with double grooves ¼".—Prices with samples to Frank Kent, Carlton House, Regent Street, S.W. 1. 1039

WANTED, ½-H.P. Motor, 220 volts, 1000 R.P.M.—Napier and Wheeldon, Walliker Street, Hull. 3699

WANTED, 5-H.P., 230/240 volts, D.C. shunt Motor, with starter. John Stewart, Electric Lighting Station, Boyle. 3624

WANTED, 80-H.P. Rotary Converter, A.C. 500 volts, 3-phase, 50 periods, to D.C. 220 volts, compound wound if possible. —1036, ELECTRICAL REVIEW, 4, Ludgate Hill, London

WANTED, 100-V., D.C. Generator, 45/50-kilowatt; 55 yards 37/12, or equivalent, V.I.R. or V.B. Cable.—Barnett and Soans, Kettering. 3683

WANTED, 250-KW. Steam driven Generating Set, consisting of Vertical Inverted, Enclosed High-speed Compound Steam Engine, direct coupled to three-phase Alternator, 550 volts, 50 cycles.—Western Engineering Company, Swansea. 7861

WANTED, 750/800-KW. Steam Generating Set, coupled to a D.C Generator of about 800-KW. at 240/250 volts., steam pressure 125 lbs. To be suitable for working to Condenser or as a back pressure engine with 20 to 25 lbs. back pressure.—Thames Paper Co., Ltd., "Thames Mills," Purfleet, Essex. 1051

3-H.P. Rotor Starter, complete, A.E.G., single-phase, 200 V., 50 periods, A.C.—Reeves, printer, Caledonian Road, London. 3755

10/30 K.V.A. Rotary Converter, A.C. side 350 volts, 40/50 frequency; D.C. side, 500 volts.—829, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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MISCELLANEOUS.

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(Continued on next page.)

MISCELLANEOUS.—*Continued.*

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WANTED, purchase Price Lists and particulars from manufacturers interested in the reconstruction of old metal filament lamps.—3534, ELECTRICAL REVIEW, Ludgate Hill, London.

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PERSONAL.

MR. R. MILLETT has been recently appointed by The Electric Construction Co., Ltd., Wolverhampton, as their sole Lancashire and Yorkshire Agent. Offices: 30, Cross Street, Manchester. Tel. No.: 7772 City. 1067

NOTICES RELATING TO PATENTS.

Latest time for receiving, 5 p.m. Wednesday.

John E. Raworth & Moss,

5, Victoria Street, WESTMINSTER. S.W.1. Chartered Patent Agents.

READ Hoad & Co.'s offer, under Miscellaneous, if you want sales pushed. 3689

OFFICIAL NOTICES.

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H. G. STEAVENSON,
Town Clerk.

Town Clerk's Office,
Darlington.
June 22nd, 1920. 1117

CITY AND COUNTY OF KINGSTON-UPON-HULL.

Electricity Department.

CONTRACT 85.—One 3-Motor Electrically Operated Overhead Travelling Crane.

THE ELECTRICITY COMMITTEE of the Hull Corporation are prepared to receive Tenders for the supply, erection, and setting to work of the Plant comprised in the above Contract.

Forms of Tender and Specification may be obtained by depositing the sum of Two Guineas with the City Treasurer, T. G. Milner, Esq., Guildhall, Hull, for each copy required, such deposit being returnable on receipt of a *bona-fide* tender.

Tenders, endorsed "Crane," are to be addressed and delivered under seal to the Chairman of the Electricity Committee, Guildhall, Hull, by not later than noon on MONDAY, JULY 12th, 1920.

The Corporation do not bind themselves to accept the lowest or any Tender.

Any further information can be obtained from the undersigned.

H. BELL,
City Electrical Engineer.

Electricity Works,
Sculcoates Lane, Hull.
June 22nd, 1920. 1089

OFFICIAL NOTICES.—*(Continued.)*

COMMONWEALTH OF AUSTRALIA.

Postmaster-General's Department.

TENDERS are invited up to AUGUST 2nd and 5th, 1920, respectively for the supply and delivery to the Postmaster General's Department, State of New South Wales, of (*a*) Aluminium Sheet, Brass Rod, &c., as per Schedule 769, and (*b*) Platinum Wire, Gold and Silver Wire, &c., as per Schedule 768.

Tender Forms, &c., can be obtained at the High Commissioner's Office, Room 406, Australia House, Strand, W.C. 2.

GEO. H. WISE,
Postmaster General.
814

COMMONWEALTH OF AUSTRALIA.

Postmaster-General's Department.

TENDERS are invited up to AUGUST 3rd, 1920, for the supply, delivery, and erection at the Telegraph Office, Perth, Western Australia, of 326 Accumulators, in accordance with Schedule W.A.668.

Tender Forms, &c., may be obtained at the Office of the High Commissioner for Australia, Room 406, Australia House, Strand, W.C. 2.

GEO. H. WISE,
Postmaster General.
815

EDUCATIONAL NOTICES.

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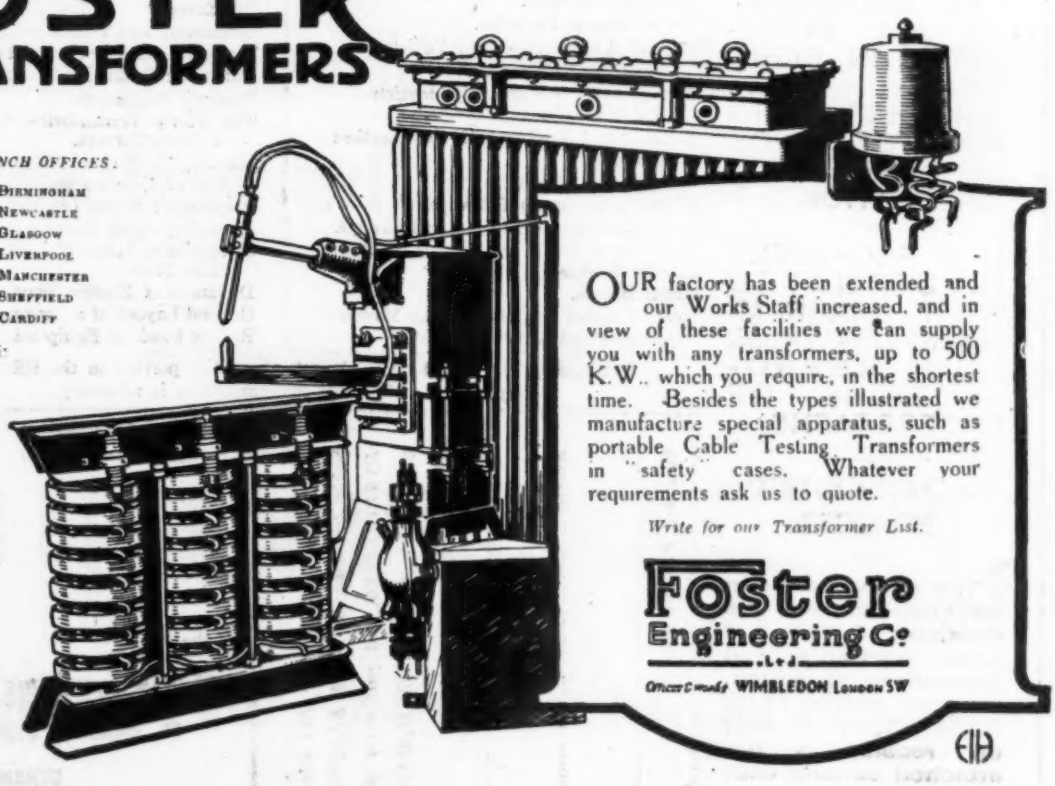

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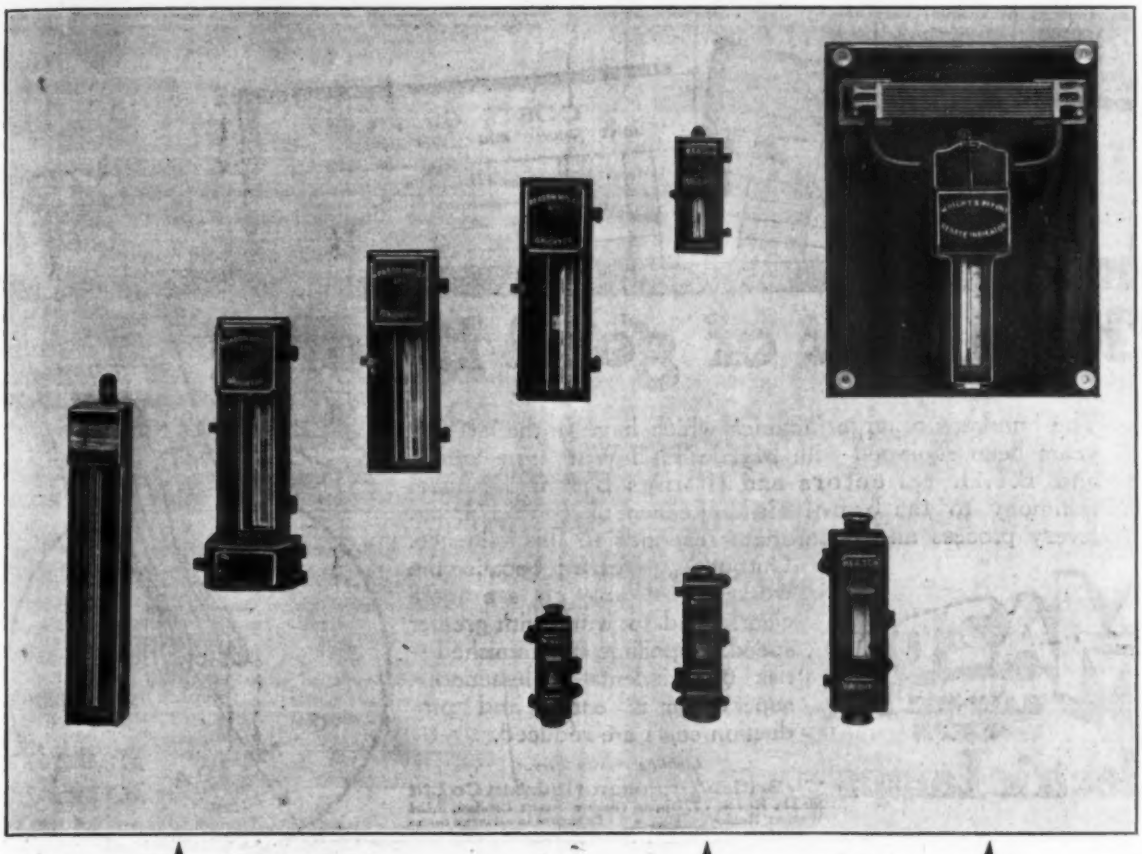

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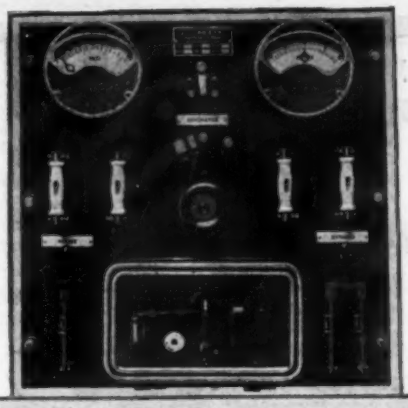

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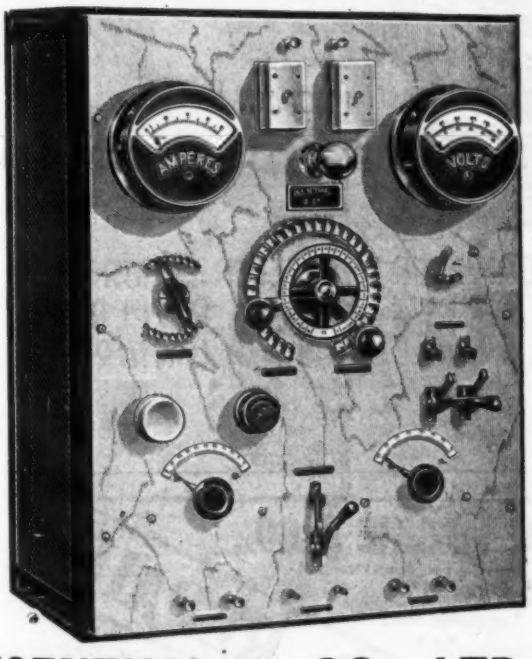

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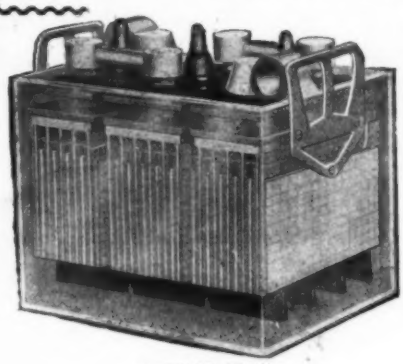

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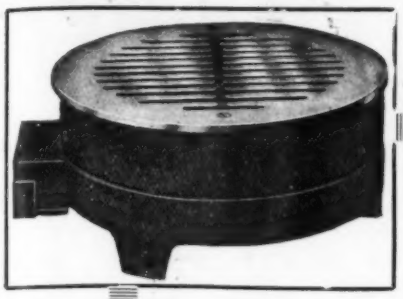

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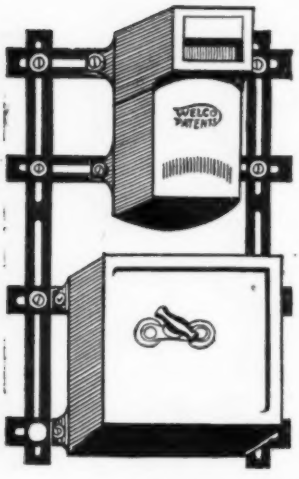

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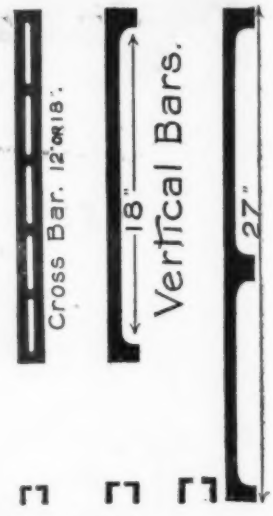

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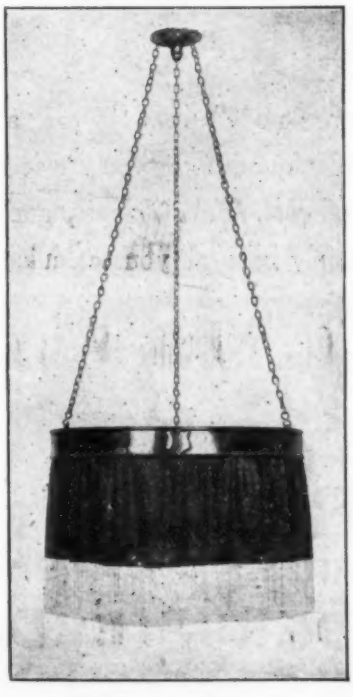

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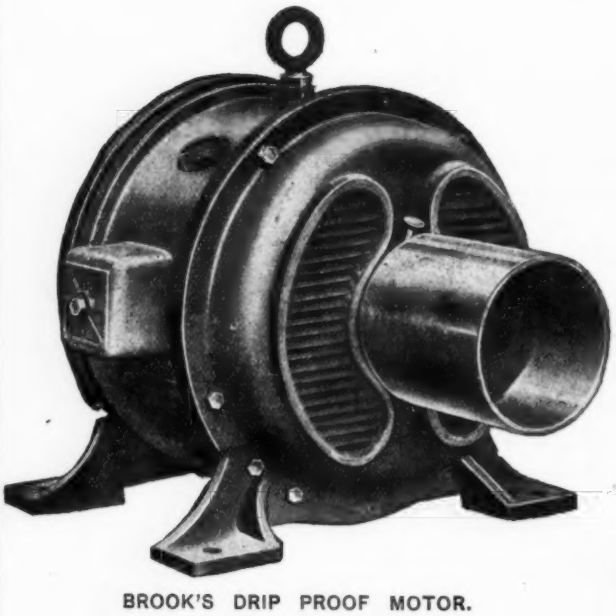

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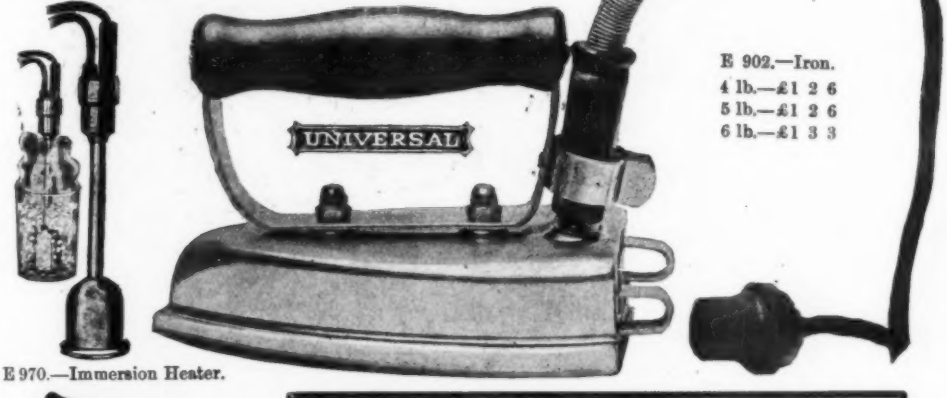

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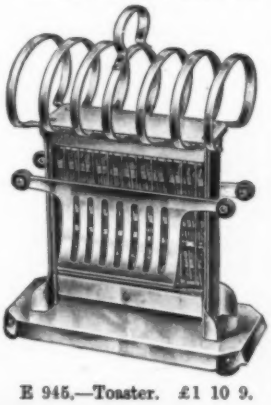

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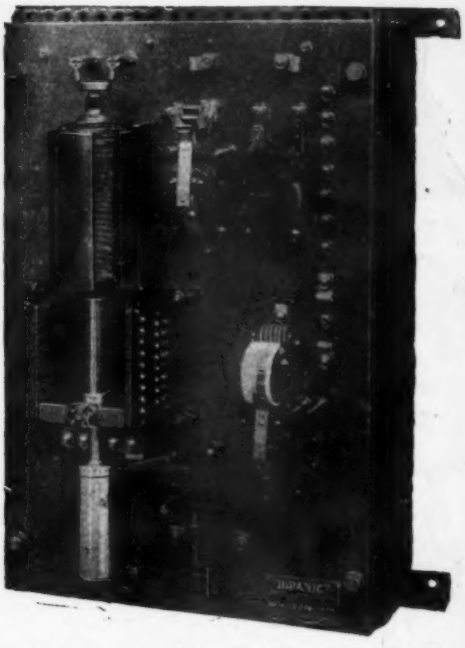

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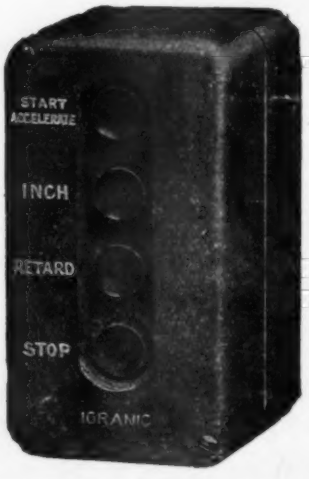

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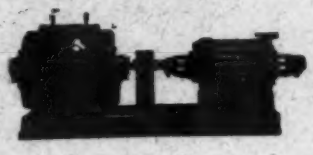

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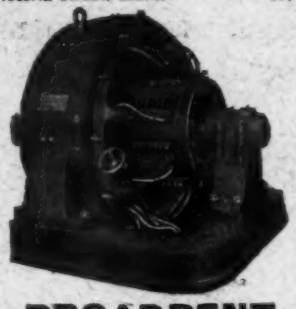

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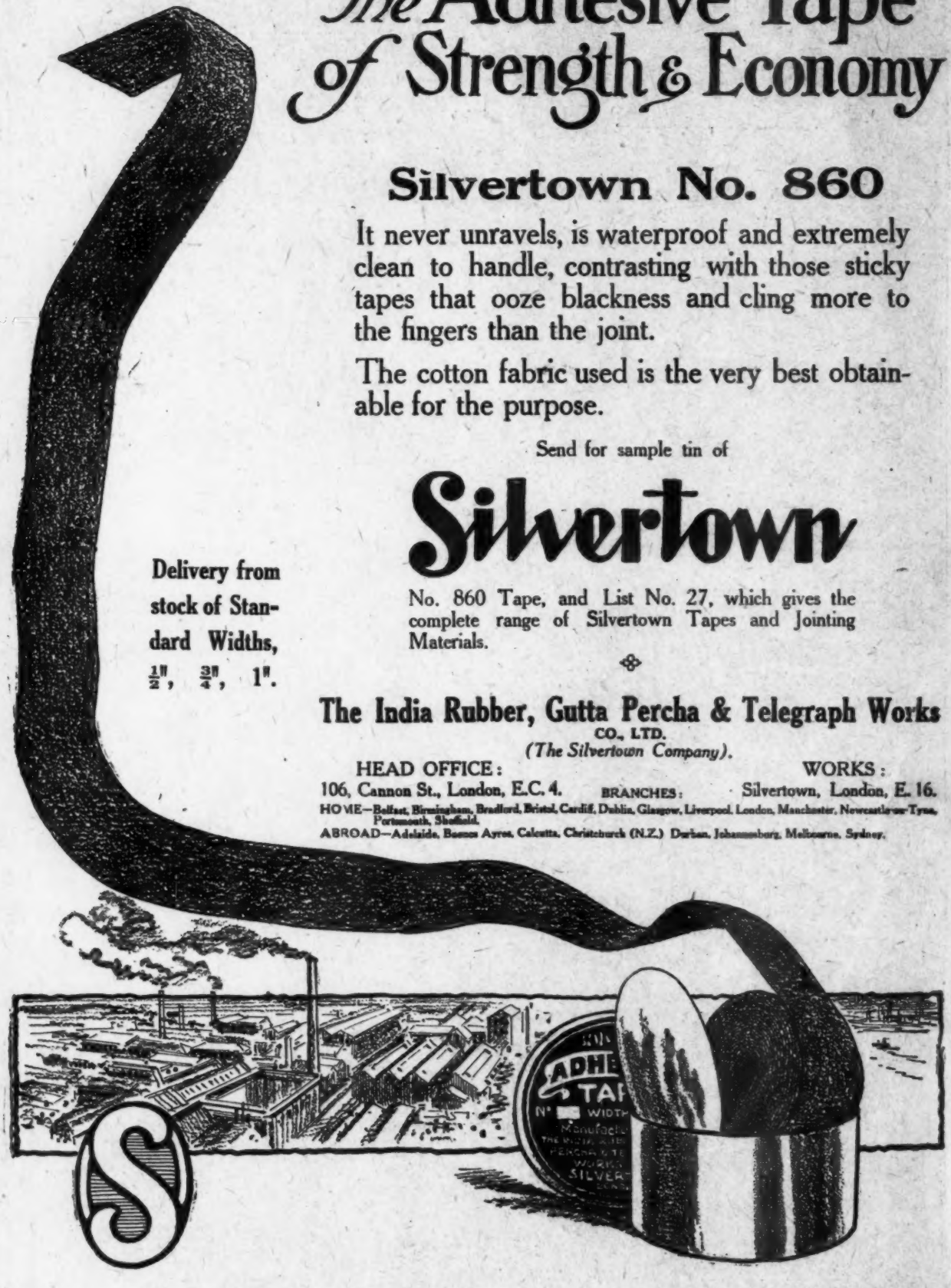

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